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Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

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J. D. ROMAINE, *Chief Agronomist*
Editorial Office: Investment Bldg., Washington, D. C.

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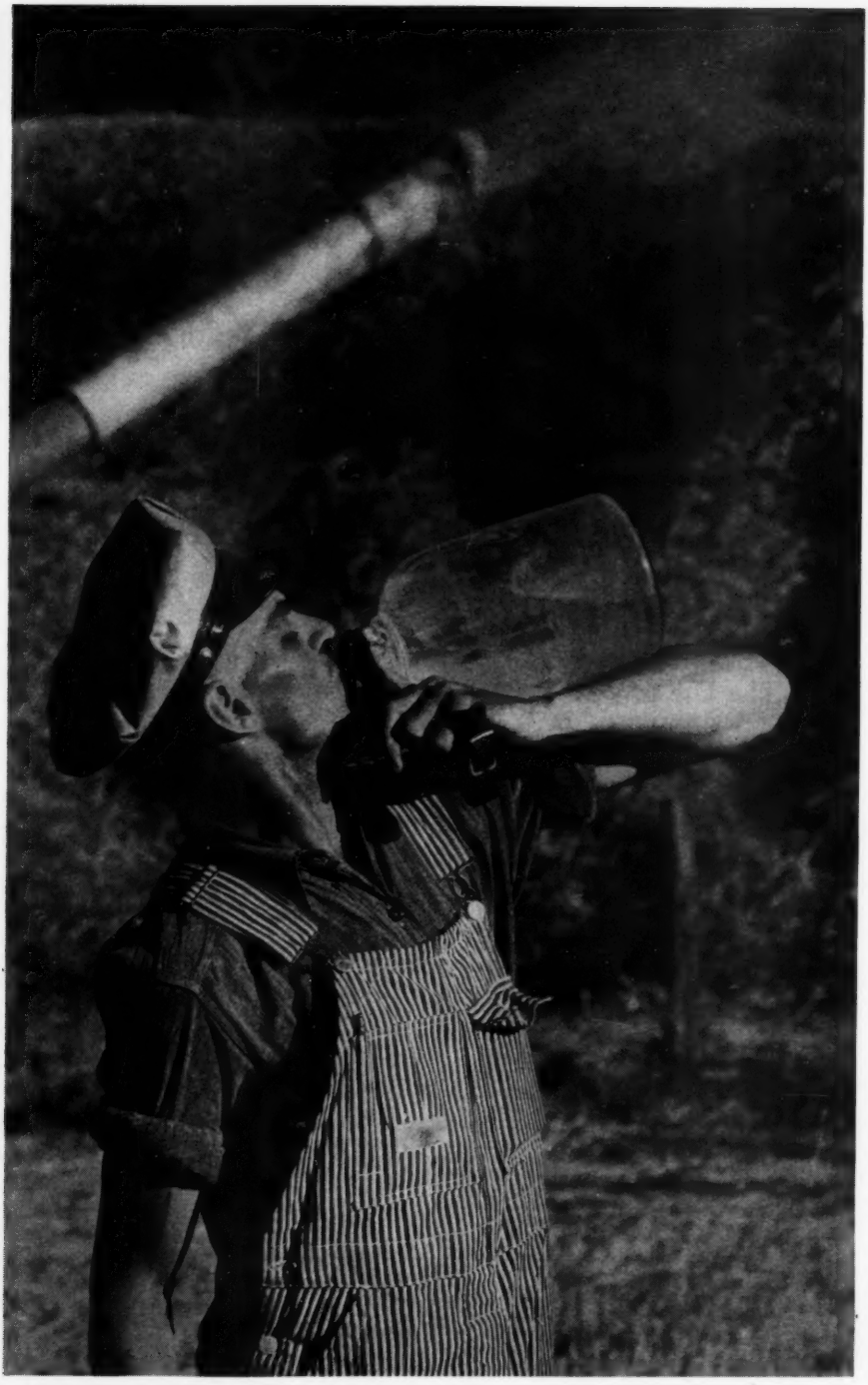

A GOOD JUG OF PURE WATER IS ALMOST A "NECESSITY" IN THRESHING EQUIPMENT.

Better Crops with PLANT FOOD

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Frosted Ideas for—

Keeping Cool

Jeff McDermid

THE parboiled genus homo was more common in the days of my youth, before they invented ice-by-wire, electric fans, perforated underwear, stream-lined summer resorts, and dial stop control over campaign orators. I know you think at once that I have left out the pièce de résistance for summer comfort and coolness, viz., the scantily dressed debutante, who now parades in epidermic exposure undismayed.

Some say summers have moderated since the depression, claiming that sun spots are the cause of both thermal and financial decadence. But my consultants, the weather bureau and the bureau of agricultural economics disclaim any direct relation between the heat of the sun and the warmth of rural opinion. Human blind spots rather than planetary sun spots seem to augment bucolic heat.

Tanned and blistered skins are certainly sure evidence of a kind suitable for admittance to a court to prove that Old Sol is still on the summertime job. Today we would find more folks with chocolate skins and sunburn regardless of their calling than our settlements could muster when I was going barefoot. Where are the mincing purple parasols and voluminous bathing suits of yesterday? How can you tell the difference between a rear view of a bunch of leather-necked farmers and a country club convention in these days of outdoor living?

This means that there are more of our population getting their hides exposed to thermal rays than back in the days when it was mostly ditch-diggers and patient hay-shakers who were the ignorant beneficiaries of ultra-violet therapy.

Compare the little Lord Fauntleroy ideals of my departed youth with the bareheaded urchins who loiter in loin cloths and resemble a papoose or a piccaninny on any city street. When you attend summer picnics these days the roasted chicken legs are no browner or more appealing than the other chicken legs draped around the ant-infested board. You even find more sunburn salve on sale in department stores than corn plasters in the Victorian era. So avid is the craze that they carry on an artificial trade in imitation tan and homemade blisters for the unfortunate denizens of the shady zones who find vacations too short or costly in which to get fried on both sides.

NOW all this shows beyond doubt that the American scene is more exposed to the sun than ever before in its hectic history. If there are any astronomical nebulae we go nude and defy them, if there are any sun spots we laugh them off. In short, we have laughed everything off, pretty much, and get right down to the surface of things. We alternate between heat waves and hair waves, and glory in our personal freedom from inhibitions and chafing clothes. We sometimes pant, but never in pants.

When I think of all the nosey constables who arrested old chums of my perspiring youth for going in wading without their breeches, it makes me want to have the government refund their fines. Guardians of the law had no latitude or imagination. You had to go away back in some thicket and feed the mosquitoes in order to shuck off your shorts and go swimming. Back in 1900 a woman's knee-cap was as unknown as a radiator cap to polite society. When I ponder thus on all the covered beauty that went to waste in my generation, it makes me happy over the heat wave, at least for what it brings to pass in visible ornaments.

If temper and temperature can be traced to a common denominator, I can easily see why I so often lived in the dog house in my teens. My parents were bound by the conservative dictums of the age, and their spiritual scruples were not varied enough to permit the presence of mint juleps on the porch or bathroom costumes in the parlor. It is true that my mother often mixed up what she thought was a cooling concoction, composed of sugar, vinegar, and water, plus a dash of bicarbonate of soda, which we grabbed and slopped down our gullets before it stopped foaming. That and the palm-leaf fan, together with vernal fortitude and Christian resignation, were the chief coolerators employed in all my campaign summers between Cleveland and Taft.

Naturally they made things hotter at every open reference to the humid weather or the protective tariff and bimetalism. In this respect I feel we have made very little headway, for we still greet each other with reminders of the heat, and we talk politics in lieu of any closer scandals. Yet in most other items we have gained ground in our ability to live in the same universe with a boiling sun and a stifling candidate. With the aid of newly discovered comfort devices, we become well resigned to the situation, knowing that we'll shiver fast enough as soon as election is over and the tax bills arrive.

MODERN comforts have been a boon to fat folks, who don't complain like they used to during the dog days. I had an uncle who carried so much lard that he spent the hot days down cellar near the potato bin. He may have had another reason for choosing this resort, but if so he never let me taste it. It removes much sorrow from the lives of hefty persons to be reasonably cool in summer, for in winter everybody envies them. Es-

pecially thin ones, who get so thoroughly cool in summer that it makes them jittery all winter.

Another characteristic of our modern summer is going bareheaded, just to make it unanimous all over. Three years ago I lost my hat up in Ontario, and catching some of the Scotch thrift thereabouts, I bought no substitute that season. This led me into total elimination of headgear from May to October, at no alarming damage to my scalp

locks and no appreciable diminution of brain power. Those who have neither would suffer even less. Nudity of the noodle is my only hostage to modern trends. It is a custom which spreads from collegiate centers outward to summer resorts, city parks, and open country towns.

The straw hat business has taken a licking. For a time they tried to forestall the calamity by making straw bonnets for farm horses and dray teams, but along came the tractor and the truck and spoiled that scheme. They are trying to tease it back again, however, by selling light toppers with green and blue cellophane eye-shades built in the vizors—so maybe before we get cross-eyed with the heat we'd better adopt them.

IN other days the art of keeping cool had not been commercialized, advertised, and dramatized so much. Summers in the average small inland town were not very much different than winters as far as routine was concerned. The folks of our middle class gentry seldom relaxed to the extent of going afar off to alluring vacation spots. We knew some bigwigs occasionally who starched and primped up to take the waters at some fashionable spa, but to us summer meant loosening corset stays and shirt collars while sipping lemonade or attending a church lawn social.

Winter was cold and summer was hot, that was all. You took both in the same stride and maintained your dignity at all costs. The best item about summer, we remarked, was the thrift involved. One did not eat quite so much expensive meat, the heavy broadcloth could be treasured in moth balls, and the fireplaces and base burner stoves were not yawning for coal and cord wood. It was a time to go boating and bring home catfish, bullheads, and pickerel as larder lifters. The kitchen garden behind every village home had its vestiges of vegetables left in the wake of small boys and busy hens.

THE main cash outlays during the whole summer season were at circus and fair time, and one might offset that somewhat by toting elephant water and raising prize pumpkins. Oh, yes, sometimes a chautauqua got subscribed to by local uplifters, and Pa had to dig a little deeper than usual during the vernal equinox. In other words, we managed to keep cool like Coolidge, renouncing all vanity and excess expenditure in an era when Vermont caution was more typically American than New York notions and Miami manners.

We ate fresh food because we had to eat it that way or call the doctor. Everything green was rushed at once into the groceries, placed under jet spray fountains in the windows, and taken home to be served at once. You kept the milk pitcher down in the cellar filled to the brim just as it came from the dusty delivery, or in the spring house if you lived on a farm. Here also was the firkin of dairy butter of more or less rancidity. Drug stores dispensed root beer, ginger beer,

(*Turn to page* 47)

The Use of Fertilizers In Soil Conservation

By H. H. Bennett

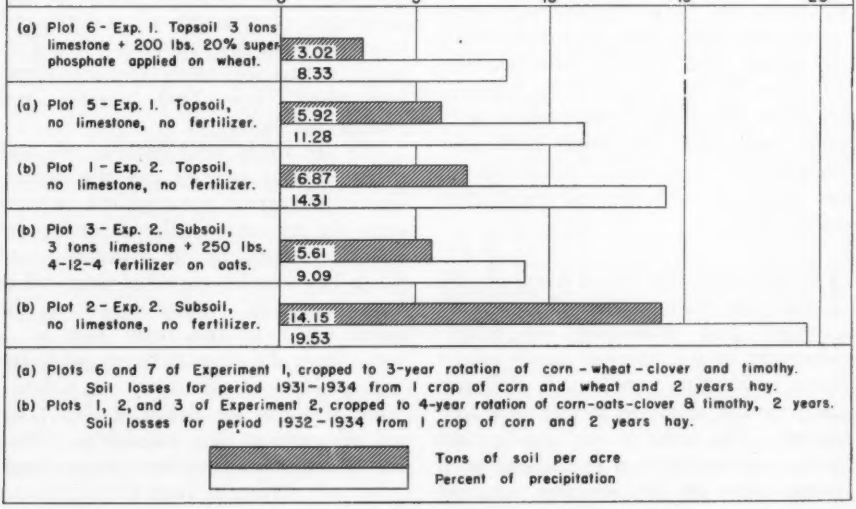
Chief, Soil Conservation Service, U. S. Department of Agriculture, Washington, D. C.

WHAT is the relationship between soil fertility and soil erosion? Is fertile soil more or less susceptible to erosion than non-fertile soil? Does fertility affect the rate or amount of soil loss by erosion? What effect does it have on surface water runoff? Does the use of commercial fertilizers speed up or retard the erosion process? Is it worthwhile to apply fertilizers on fields subject to erosion? Should the use of commercial fertilizers be included in plans for soil conservation? In recent years, the Soil Conservation Service of the U. S. Department of Agriculture has found answers, or at least partial answers, to most of these questions. And largely as a result of research by this agency, it is now generally recognized that soil fertility is one of the first essentials of effective soil conservation.

At its Bethany, Missouri, experiment station, for example, the Soil Conservation Service found that the use of commercial fertilizers in a corn, small grain, clover-grass rotation resulted in a marked decrease in soil loss from erosion. The reductions in soil and water losses, resulting from the application of fertilizer and lime to the surface soil and the exposed subsoil, are well illustrated by Figure I.

These results covering a 4-year period (1931-1934 inclusive) of experimentation at Bethany, Missouri, showed that by applying 3 tons of ground limestone

FIGURE I. Average Annual Soil and Water Losses as Affected by Applications of Lime and Fertilizer, from 8 Percent Slope of Shelby Silt Loam at Bethany, Missouri.


0
5
10
15
20
(a) Plot 6 - Exp. 1. Topsoil 3 tons limestone + 200 lbs. 20% superphosphate applied on wheat.
3.02
8.33
(a) Plot 5 - Exp. 1. Topsoil, no limestone, no fertilizer.
5.92
11.28
(b) Plot 1 - Exp. 2. Topsoil, no limestone, no fertilizer.
6.87
14.31
(b) Plot 3 - Exp. 2. Subsoil, 3 tons limestone + 250 lbs. 4-12-4 fertilizer on oats.
5.61
9.09
(b) Plot 2 - Exp. 2. Subsoil, no limestone, no fertilizer.
14.15
19.53
(a) Plots 6 and 7 of Experiment 1, cropped to 3-year rotation of corn - wheat - clover and timothy. Soil losses for period 1931-1934 from 1 crop of corn and wheat and 2 years hay.
(b) Plots 1, 2, and 3 of Experiment 2, cropped to 4-year rotation of corn-oats-clover & timothy, 2 years. Soil losses for period 1932-1934 from 1 crop of corn and 2 years hay.
Tons of soil per acre
Percent of precipitation

and 200 pounds of 20% superphosphate to wheat in a 3-year rotation (Plot 6, Experiment 1), the soil loss was reduced by 49% and the water loss as runoff by 26.1% of those losses recorded for the adjoining area of topsoil (Plot 5, Experiment 1), which was not fertilized or limed.

The soil and water losses from the untreated Shelby topsoil cropped to two years of clover and timothy followed by a crop of corn (Plot 1, Experiment 2) were only 48.55%, which was 73.28% as large as the losses recorded for Plot 2, Experiment 2, representing the untreated exposed subsoil similarly cropped. By treating the exposed subsoil with 3 tons of finely ground limestone and 250 pounds per acre of 4-12-4 fertilizer (Plot 3, Experiment 2) before oats, the soil loss for the two years in meadow and one year in corn was reduced to 39.65%, and the water loss to 46.49% of the losses recorded for the unfertilized and unlimed subsoil.

An adjacent area, with topsoil intact, was treated with 8 tons of manure per acre, together with the return of crop residues and an addition of 200 pounds of 20% superphosphate and 3 tons of ground limestone. The average annual losses from this area were 3.74 tons per acre. Where fertilizer and lime were applied to the topsoil, but the crop residues removed and no manure added, the soil loss per acre was 7.79 tons, more than double the loss on the other area.

At the Tyler, Texas, soil and water conservation experiment station, the average annual soil loss from Kirvin fine sandy loam cropped to cotton (where surface soil remained, but no fertilizer used) was 19.08 tons per acre. On the adjoining area, where 400 pounds of 4-8-4 fertilizer were applied, the soil loss was 17.95 tons per acre. Unfertilized subsoil, similarly cropped, lost soil at the rate of 65.29 tons per acre, along with 9.92 inches of rain water. The addition of 400 pounds of 4-8-4 fertilizer reduced the soil loss only slightly. But when a winter cover crop was used along with the same quantity of fertilizer, the annual soil loss was reduced to 48.94 tons per acre. These experiments covered a period of four years, 1931 to 1934, inclusive.

The subsoil of some types of land is more productive relatively than that of other types. But in practically all cases,

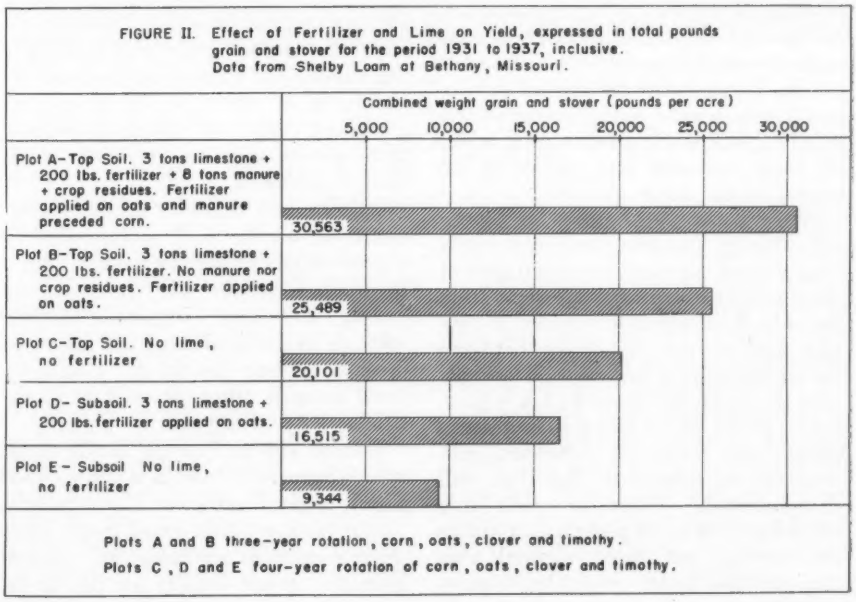

Combined weight grain and stover (pounds per acre)
5,000
10,000
15,000
20,000
25,000
30,000
Plot A–Top Soil. 3 tons limestone + 200 lbs. fertilizer + 8 tons manure + crop residues. Fertilizer applied on oats and manure preceded corn.
30,563
Plot B–Top Soil. 3 tons limestone + 200 lbs. fertilizer. No manure nor crop residues. Fertilizer applied on oats.
25,489
Plot C–Top Soil. No lime, no fertilizer
20,101
Plot D– Subsoil. 3 tons limestone + 200 lbs. fertilizer applied on oats.
16,515
Plot E– Subsoil No lime, no fertilizer
9,344
Plots A and B three–year rotation, corn, oats, clover and timothy.
Plots C, D and E four–year rotation of corn, oats, clover and timothy.

FIGURE II. Effect of Fertilizer and Lime on Yield, expressed in total pounds grain and stover for the period 1931 to 1937, inclusive. Data from Shelby Loam at Bethany, Missouri.

the exposed subsoil is less productive than the surface soil that once covered it. In like manner, while the subsoil responds to fertilizer applications, the results are much more economical when applied to the topsoil. This point is well illustrated by Figure II, which graphically represents the effect of fertilizer and lime on yields of both topsoil and subsoil of the Shelby loam at Bethany, Missouri.

Cotton yields produced by an application of 400 pounds of 4-8-4 fertilizer on two areas of Kirvin fine sandy loam (one with a cover of topsoil and the other with the subsoil exposed), near Tyler in eastern Texas, showed comparable results to those secured at Bethany. The average per acre yield of seed cotton for the period of 1931 to 1934 was increased on the exposed subsoil from 50 to 206 pounds by the application of the complete fertilizer, while for the topsoil the increase was from 365 to 580 pounds. Although the average per acre yield was markedly increased by the application of fertilizer in both instances, it will be noted that the average yield for the exposed subsoil, even after receiving a complete fertilizer, was still 43% less than the yield from the unfertilized topsoil. The application of 400 pounds of 4-8-4 fertilizer per acre to the Nacogdoches fine sandy loam in eastern Texas, where the subsoil was exposed, gave a yield of seed cotton which was 71% below the yield secured when the same treatment was applied to the topsoil of the same soil type.

When cotton was grown at Statesville, North Carolina, on Cecil sandy loam, one of the most important soils of the Southern Piedmont, the yield from the subsoil to which was added a complete fertilizer was 20% below that from the corresponding unfertilized topsoil.

In the Southeast where kudzu is proving to be one of the best erosion control plants, the value of fertilizer, particularly superphosphate, has been well demonstrated. Extensive trials conducted in 1938 on 41 plantings of kudzu on varying soil types showed conclusively that kudzu responded to phosphate on all soils included in the trial. In every case, there was a marked increase in growth where fertilizer was applied, and the heavier applications produced correspondingly greater growth. Figures III and IV illustrate the effect of fertilizer in establishing a stand of this soil-improving legume.

These increases in crop yields, along with the reduction in soil and water losses which have resulted when fertilizers were used (on either topsoil or subsoil) in combination with other soil conservation practices, point out the importance of commercial fertilizers in erosion control and soil conservation. The findings on soil conservation experiment stations, together with extensive field observations throughout the country, show the urgent need for initiating soil conservation measures, including fertilizer applications, before the topsoil is removed and the less fertile subsoil exposed. While the productivity level of erosion-exposed subsoils can be raised very materially through the use of fertilizer, manure, green manure, and crop rotations, it is obvious that these same measures, when applied to land where the topsoil remains, insure more complete erosion control and give much higher economic returns. This helps to secure a vigorous growth of protective vegetation. Satisfactory results from the standpoint of yields, as well as soil conservation, cannot be obtained without first ameliorating any existing plant-food deficiencies.

Density and character of the vegetative cover on the land, maintenance of a good supply of organic matter, plus a favorable granular soil structure, are among the most important fundamentals in prevention of soil losses by erosion. These factors are closely related to each other, as well as to the productivity of the soil.

Except for excessively sandy land, most virgin soils contain a fair to good supply of plant nutrients. Consequently, virgin soils produce good crops when other conditions are favorable. Present problems of soil fertility are due to the

Fig. III.—Sparse growth of kudzu planted in the spring of 1938, as it appeared on August 25th of the same year.

Fig. IV.—Vigorous growth of kudzu as it appeared on August 25, 1938, planted at the same time as that in Fig. III, but fertilized with 800 lb. of basic slag.

fact that continuous cropping, particularly to clean-tilled crops, has accelerated erosion on millions of acres. The inevitable result has been that productive topsoil was washed away, leaving a much less productive subsoil exposed. These same acres under different treatment might show no erosion at all, or at least would have suffered to a lesser degree. For instance, a good cover of grass, clover, or other dense-growing vegetation, as well as good forest cover, is highly effective in checking erosion. The appearance of subsoil in a field is not the yardstick by which decreased fertility, due to erosion, is measured. Long before subsoil appears, declining productivity reflected in reduced yields and lowered feeding value of crops are danger flags serving notice that erosion is speeding up.

It is, of course, impractical to devote all land to such protective vegetation. But suitable crop rotations, supported by adaptable fertilizers when needed, along with other proved soil conservation measures, do make it possible to safeguard vast areas of cultivated land from the ravages of erosion.

Large-scale field operations by the Soil Conservation Service, involving millions of acres, have substantiated the vital role of soil fertility in soil conservation. Fertility must be maintained at the highest practicable level, if erosion is to be checked permanently.

Left: South Carolina truck experiment station and laboratory building. Right: Office and laboratory building, U. S. vegetable breeding laboratory. Center: Headhouse and greenhouses.

Breeding Vegetables For the South

By R. A. McGinty

Vice-director, Clemson Agricultural College, Clemson, South Carolina

FOR a long time southern gardeners and truck farmers have labored under the handicap of having to plant varieties of vegetables developed by northern and western breeders for conditions widely different from those prevailing in the South. Despite this, they have achieved considerable success in producing a number of vegetable crops, but the fact that many of the varieties grown are ill-adapted to the climatic and soil conditions of the producing locality often means that poor yields, poor quality, and unsatisfactory monetary returns are secured.

Recent developments, however, offer promise that this handicap in the production of vegetable crops in the South will soon be overcome. A laboratory which is the first of its kind in the world has been established at Charleston, South Carolina, with the objective of developing high quality, disease-resistant varieties and strains of vegetables adapted to southern conditions. Both State and Federal research agencies are cooperating to make the undertaking a success.

The attack on this problem was made possible when Congress in June 1935 passed the Bankhead-Jones Act which, among other things, provided for the establishment and maintenance by the U. S. Department of Agriculture of research laboratories for work upon regional agricultural problems.

At a conference of directors of the experiment stations in the southeastern States held at Athens, Georgia, early in September following the passage of the Act, it was decided to request the Secretary of Agriculture to establish a laboratory or laboratories for (1) the investigation of the serious nematode problem in the southeast and/or (2) the breeding of fruits and vegetables for the southern States. A formal request to this effect was forwarded to the Secretary. After consideration by department officials, the conclusion was reached that the breeding of vegetables adapted to southern conditions was, in view of all the circumstances, the most promising of these suggested lines of work.

Since the laboratory for this work was to be under the supervision of the Bureau of Plant Industry, officials of that bureau immediately began the investigation of possible locations for such a laboratory, with the result that the truck-growing area near Charleston was found to have, more nearly than any other locality considered, the features deemed desirable for the proposed research. It should be noted here that the term "laboratory" as used in the Act was interpreted to include not only the actual laboratory building or buildings, but also lands and other facilities needed.

At a meeting of the southern experiment station directors in Washington in November 1935, the decision of the Department of Agriculture regarding the type of research laboratory and its location was presented, and the general plans for the laboratory were approved by the directors. Thus were concluded the preliminary steps leading to the establishment of what is now known as the U. S. Regional Vegetable Breeding Laboratory, which was the first to be set up under the Bankhead-Jones Act. Since 1935, eight other Bankhead-Jones laboratories have been erected in various regions of the country to investigate important problems affecting the agriculture of those regions.

In deciding to devote this laboratory to the breeding of vegetables for the South instead of some other line of investigational work, several factors were considered. For one thing, the problem is concrete and relatively

Courtesy U. S. D. A.

Portion of U. S. Regional Vegetable Breeding Laboratory farm. Cabbage plots in the foreground.

limited in scope; second, vegetable breeding was not receiving a great deal of attention from southern experiment stations. In addition men trained in plant breeding were available to make up the staff of the laboratory, and above everything else, better varieties of vegetables were greatly needed.

A factor in determining the site for the laboratory was the South Carolina Truck Experiment Station located a short distance west of Charleston in the heart of the vegetable-producing area. The South Carolina Experiment Station, of which the Truck Station is a branch, agreed to deed the Department of Agriculture sufficient land adjacent to the Truck Station buildings upon which to erect the laboratory and office building, greenhouses, headhouse, and other structures in order to make possible joint use of the water supply developed by the Truck Station and to facilitate cooperation between the two agencies. Also adjacent to the Truck Station were found 400 acres of land suitable for vegetable crops, which could be purchased for the use of the laboratory. This land was acquired, and the necessary farm buildings and residences were erected. The establishment and organization of this laboratory have served as a pattern for those subsequently established.

In initiating the program of research at the Bankhead-Jones laboratories, the Department of Agriculture wisely decided to ask the experiment stations in the several States comprising the region in which a laboratory is located to appoint representatives who together make up an advisory committee whose function is to assist in the planning of the program of research to be undertaken by the laboratory. Usually this committee meets annually with the laboratory staff and bureau officials, discusses the progress made to date, and advises as to changes suggested in the program for the following year. In

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Courtesy U. S. D. A.

State experiment station representatives, U. S. D. A. officials, and Laboratory staff assembled for the annual meeting at the U. S. Regional Vegetable Breeding Laboratory. Bottom row left to right: J. F. Wood, W. S. Flory, Tex.; Seth Locke, Ark.; F. S. Jamison, Fla.; J. C. Miller, La.; J. M. Jenkins, Jr., S. C.; S. H. Yarnell, Tex.; W. D. Valleau, Ky.; S. A. Morrell, P. C. Grimball, Lab. staff; W. C. Barnes, S. C.; H. L. Cochran, Ga.; M. N. Walker, Fla.; B. D. Drain, A. B. Strand, Tenn.; H. H. Zimmerly, Va.; A. M. Musser, S. C. Top row: J. W. Wellington, U. S. D. A.; H. B. Cordner, Okla.; C. F. Poole, Lab. staff; R. A. McGinty, S. C.; K. C. Barrons, Ala.; C. F. Andrus, Lab. staff; V. R. Boswell, U. S. D. A.; H. M. Thomas, E. L. Blitch, Lab. staff; B. L. Wade, in charge of Lab.; Robt. Schmidt, N. C.; L. M. Farish, Miss.; J. B. Edmond, S. C.; H. T. Cook, Va.

Pioneers—1939 Model

By Kenneth S. Davis

Soil Conservation Service, U. S. D. A., Milwaukee, Wisconsin

"GOD never meant this country to be farmed!" A. D. Wilson, indicated, with a wave of his arm, the desolate tangle of wilderness sliding past the car window—vast, lonely, and so flat that the sky seemed to rest on the treetops.

We were driving along the road south of Faunce, in the southwest part of Lake of the Woods County, Minnesota. For miles on either hand lay burned-over, cut-over forest, the stark dead trees standing up against the sky like something Doré had drawn to illustrate Dante's Inferno.

"But that didn't keep people from coming in," Wilson went on. "Not that they can be blamed . . ." He reviewed for his writer-companion the history of this "land of false hope."

Thousands of years ago, all of this section of Minnesota was covered by Lake Agassiz, the glacial lake which existed for a time during the retreat of the last great ice sheet. After the lake disappeared a thick vegetative growth in its bed formed a layer of peat varying from a few inches to 20 feet in depth, with the average being approximately 3 feet.

The "big bog" thus formed extends over 1,500,000 acres in Koochiching, Beltrami, Lake of the Woods, and Roseau Counties, and a portion of Itasca County. Until the early part of the twentieth century, the area was virtually ignored by the white man. But with the disappearance of the western frontier, men turned yearning eyes northward in search of "free land."

Then came the drainage "boom." A vast network of ditches was laid out to drain the "big bog." Settlers were urged to come in. And they came, most of them hoping for new farm homes, but many with their eyes set on the commercially valuable timber that covered low islands and sand ridges in the ancient lake bed. With fire and ax and plow the land was cleared. Homes were built. The futile struggle for a livelihood began.

It was a futile struggle for many reasons, Wilson explained. First and most important, the soil was not suited to farming. There are small patches of fertile soil in the area, formed by alluvial deposits in the ancient lake bed, but for the most part the silt and clay particles have been washed away, leaving only beach sand which is of small value for agricultural purposes.

A Losing Battle

Then, too, the settlers were too far from markets to dispose of poultry, eggs, or milk at a profit. The coldness and variability of the climate made such cash crops as corn a matter of chance. Subsistence farming was the only type the settlers could practice.

In supplying the economic needs of themselves and their families, the farmers might have succeeded had it not been for one great obstacle—taxes. Levied against a major portion of the land to pay for its drainage, "ditch" taxes frequently ran as high as $100 per quarter section, far more than the farmers, with their meager cash income, could afford to pay.

Small wonder that tax delinquency and settlers' bitterness grew apace. By 1928, more than 70 per cent of Lake of the Woods County assessed for ditches was tax delinquent, and by 1931, delinquency mounted to nearly 90 per cent. Scores of families gave up and moved out. Those who stayed were crushed more and more under the weight of circumstances over which they had no control.

In 1929, when it became obvious that counties would be forced to default ditch bonds unless outside help were given, the State legislature created the Red Lake Game Preserve, taking over all delinquent lands within preserve boundaries and assuming the bonded indebtedness to the extent of $2,500,000. In 1931, the legislature placed six and a half townships in the Beltrami Island State Forest, though settlers already there were permitted to stay. This improved conditions somewhat for the county, but it did nothing to solve the settler problem. That problem, it was plain, was one of "resettlement," and in 1934 the land policy section of the Agricultural Adjustment Administration undertook to solve it.

Col. L. E. Fiero, manager of the Soil Conservation Service land utilization project at Baudette, Minn., points out the ravages of forest fire. Thousands of acres of valuable timber have been destroyed by fire, which burns out the peat at the roots of the trees, causing them to topple over, roots and all.

On July 25, 1934, A. D. Wilson, northern Minnesota farmer and former extension director at the University Farm, St. Paul, came to Baudette as manager of the resettlement project. Under the Resettlement Administration, established in 1935, and later under the Bureau of Agricultural Economics, the work was continued.

Wilson's job was to buy out settlers in the problem area, adjust debts, arrange tax settlements, and "relocate" all settlers on land that was well located and suitable for cultivation. Fortunately such land was near at hand, to the west in Roseau County and to the north in Lake of the Woods and Koochiching Counties along the Rainy River, just below the Canadian line.

To handle his ticklish job, Wilson evolved the now-famous "Minnesota grubstake plan," designed not merely to improve the economic condition of the settlers but also to build up their self-confidence, rehabilitate them "spiritually," as he puts it. He considers practically all such settlers "good risks," if the resettlement work is set up on a practical basis.

When the first contact was made with the settler to arrange for purchase of his submarginal land, Wilson and his associates were careful to stress the fact that the settler's distressed economic condition was not entirely his fault. He had been mistakenly urged to come onto land that should never have been opened for settlement.

The second step was to adjust taxes and debts in such a way that the settler would have some small equity in the sale of his property. The third step, as Wilson explained it, was to "show con-

fidence in each settler by allowing him to make final selection of his future farm and by consulting with him at every step in working out plans for its development. The idea was to fit the farm to the client rather than the client to the farm."

Accordingly, no "fancy set-ups" were "given" outright to clients; the settlers were simply given an opportunity to "help themselves." The typical client was started with the land, a small house, and a couple of cows. However, he was given an opportunity to borrow up to 60 per cent of the value of any improvements made. This was the "grubstake."

"For example, if the settler clears 10 acres on his new farm, and the clearing is worth $10 an acre, he can borrow $60 against it," Wilson explained. "He will thus have invested $40 of his own labor and will have that much equity in the place. This same principle of advance applies to all improvements." Types of land purchased to "resettle" farmers have varied from absolutely wild land, with no improvements, to partially or even well-developed farms.

How does the plan work in practice? Take the case of Nick Benedix, for example. We visited him at his farm home later in the day. Nick was born in Germany 64 years ago, came to America when a boy of 5. As a young man, he worked as a coal miner in LaSalle County, Illinois. He left Illinois in 1896 and has never been back.

He farmed for 19 years near Pillager, Minnesota. Then, in 1915, he came to Lake of the Woods County, one of the hundreds who came, at the behest of State and Federal agencies, seeking "free land."

Col. Fiero shows the writer a new dam built across the Roseau River in Minn., to establish old flowages and help bring back marsh conditions. Dams, blocking old drainage ditches and streams, are raising the water table in the area, bringing back beaver, geese, and other aquatic wildlife.

There were no roads in that portion of the county where Nick chose to settle. He carried his initial "equipment" in on his back from the nearest railroad, a distance of 18 miles. He selected a 160-acre tangle of trees and brush, built log buildings, brought in his family, and began his unequal struggle with Nature for a livelihood. He worked late and early and for a time it looked as though he might make a go of it. In 1917 he built an addition to his house. "What put us back and kept us there was a lien of $370 on the farm for the ditch system," Nick told us.

All the settlers in the "big bog," Nick among them, were hard hit by the war. The price of things they had to buy

General view of the buildings on the John Szczodroski farm.

went 'way up, while the price of things they had to sell stayed about the same. Nick had credit, though, and he used it. In 1924 he put a mortgage on the place to enable him to build a barn and from then on, though it took him some time to realize it, his land was not his own.

After a succession of "tough" years, he decided to let the farm go in 1930, though he stayed on it as a tenant until 1935. Then he got his "big chance" through the Resettlement Administration. Nick "relocated" on 160 acres of absolutely wild land 6 miles south of Baudette, land he was able to purchase for $7.50 an acre.

When Nick first saw his new farm, in the summer of 1935, not a foot of it was cleared. It looked much like the brushland back in the "bog," but there was a great difference between the two, as Nick soon discovered. Beneath THIS brush and timber was good soil.

In the fall, Nick cleared 5 acres of his new farm, living in a 14 by 16-foot shanty he'd carted up in a truck from his old place. During the winter, he cleared 7 acres more. He put all his cleared land into oats as a nurse crop for alsike and alfalfa the first spring and got 115 bushels of oats off the 12 acres.

At first Nick, who didn't want to assume a large debt, planned to put up only temporary buildings, using a small amount of lumber he possessed. But A. K. Holte, who handled building arrangements for resettlement clients, advised him to make a "good start" on a permanent set-up and "add on" as he went along. Holte, Nick, and Mrs. Benedix studied several buildings under construction on other clients' farms and decided to build a house 24x28x10.

Nick, who had had some experience with concrete work, worked with his son-in-law and sons, and together they built the house on a concrete foundation, complete with full cement basement and a shingled roof, for a total cash outlay of $455.07. He's now building a barn, 32x44 feet in size and set on a concrete foundation. By next year, the Benedixes will have farm buildings worth, even in that region of low building costs, considerably more than $2,100 for a cash outlay of less than half that amount.

Today, Nick Benedix has the glint of new hope in his eyes. He's justly proud of the successful struggle he has made and of the bit he has contributed to the pioneering of Minnesota's last agricultural frontier. He has 45 acres

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Permanent Pasture Treatments Compared

By H. B. Sprague

Agronomist, Agricultural Experiment Station, New Brunswick, New Jersey

DURING the last 20 years there has been a gradual realization that permanent pastures provide feed to grazing livestock at a lower cost than any type of harvested crops. With the area of permanent pastures making up 20 to 40% of the farm land in the humid region, it is obvious that pastures constitute one of the greatest agricultural resources of the country. Generally speaking, this resource has been developed only to a small degree, although many experiments have been conducted and much has been written on the subject in recent years. It seems likely that the feed-supplying power of the permanent pasture lands may be doubled or tripled by efficient treatment and management, thereby reducing feed costs still further, as well as increasing the quality of the herbage and the seasonal uniformity in growth.

Many pasture improvement measures involve little or no cash outlay for materials and are thus within reach of all farms. Among these may be included the removal of unnecessary trees, elimination of all brush, bog plants and similar vegetation, mowing 2 to 3 times during the season to keep undesirable growth under control, and occasional distribution of animal droppings by harrowing. These practices alone have been shown to greatly increase the total herbage production. However, when they are combined with adequate soil improvement measures and effective control of grazing practices, the full value of the pasture is realized. Since pasture lands have, in general, been greatly neglected from the standpoint of maintaining soil fertility, it is not surprising to find that treatments with lime, manure, and fertilizer are of great value.

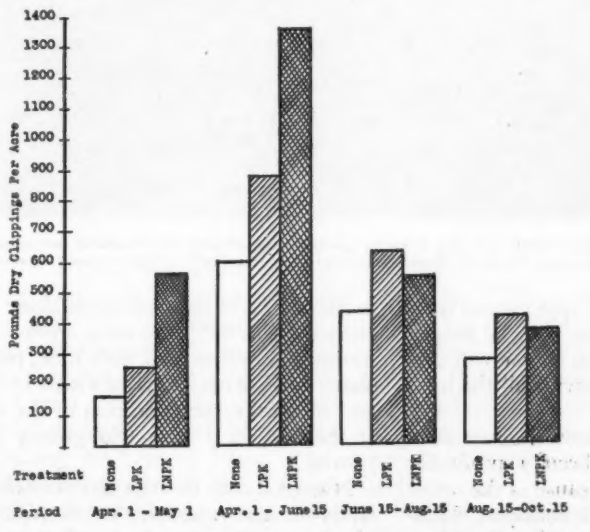

FIG. 1. EFFECT OF TREATMENT ON GROWTH OF HERBAGE IN DIFFERENT PERIODS OF THE GRAZING SEASON

One of the current problems in pasture improvement is to determine the type of soil-improving materials to use. The ideal type of treatment will naturally

depend on the type of grass sod present, the character of the soil, and its past history. Lime, whether applied as ground limestone or in some other form, has usually produced good results on acid soils only when used in conjunction with other materials. Lime alone rarely improves growth of pasture herbage, because lime is not the only limiting factor. On the other hand, the use of fertilizers without lime has often been disappointing, since both types of materials are needed to provide balanced nutrition of the grass. Except on limestone soils, in New Jersey the use of as little as one-half ton per acre of finely ground limestone has been uniformly desirable in conjunction with fertilizer or manure, even though the pH does not indicate strong acidity. Larger applications will, of course, be effective over a longer period, but one-half ton a year will distribute the cost and provide all the lime needed each year.

An application of farm manure once in 2 years has also been a profitable treatment, probably because of the nitrogen and potash which it contains. Manure reinforced with superphosphate provides a more adequate treatment than manure alone. Since manure is usually available in quantity on livestock farms, application of manure to pastures in late fall and early spring is an important part of pasture improvement in many cases.

Experiments and farm experience have repeatedly demonstrated the great value of nitrogenous fertilizers for pasture improvement. It has not been so clearly understood that nitrogen fertilizer applied alone is much less efficient than when properly balanced with other nutrient elements. An example of this response is provided by a 3-year test on a typical red soil pasture in New Jersey (Table I). The lime, phosphate, and potash were applied in alternate years, and the nitrate of soda annually in March. Although nitrogen alone increased yields 64%, the same amount of nitrogen supplemented with lime, phosphate, and potash increased yields 143%, and moreover, the condition of the sod at the end of 3 years was greatly improved.

Fig. II.—New Jersey pasture which has not been properly managed and has received no mineral treatments. Feed production may be easily doubled or tripled by inexpensive improvement measures.

Nitrogen may be supplied very effectively on many pastures by stimulation of clover with lime, phosphate, and potash. In this test, and many similar

Fig. III.—A well-managed New Jersey pasture, properly limed and fertilized. No unpalatable herbage is allowed to develop on this pasture.

ones in New Jersey, such treatment greatly increased the abundance of clover in a single year. It is interesting to note that the LPK treatment produced a strong clover sod and an annual yield of 2,236 pounds of dried clippings, in comparison with LPK plus nitrate which produced 2,466 pounds. Where clover can be stimulated by mineral fertilizers, the yields may be nearly equal to those obtained under comparatively heavy nitrogen fertilization.

Incidentally, it should be noted that potash was a very essential element when used in conjunction with other materials applied. Potash added to the LNP treatment increased yields of dry clippings 716 pounds, and when added to LP, the increase was 890 pounds of clippings. Obviously, potash is a highly essential part of a complete treatment. Although these results are for only one pasture, they are fairly typical of those obtained on a total of 25 similar tests scattered throughout New Jersey on pastures located on Coastal Plain, Piedmont, Appalachian Valley and Upland, glaciated, and river bottom soils. The degree of response varied, but the same trends were noted throughout.

Two important points in a pasture improvement program are (1) the relative cost of producing feed with the various systems of improvement, and (2) the seasonal growth of such herbage. To obtain information on these points, an experiment was conducted on a typical permanent pasture sod at New Brunswick, New Jersey. A direct comparison was made between the lime-minerals-clover system and the lime-minerals-nitrogen system of treatment. The results of a 3-year test, given in Table 2, indicate clearly that the lime and minerals treatment which stimulated clover produced feed at a lower unit cost than any other treatment. The total yield per acre, however, was greater on the plots receiving nitrogen fertilizers. The protein content for the season was nearly 19% for both types of treatment. On the 25 similar tests conducted throughout the State, palatability was highest on plots rich in clover, the nitrogen-treated plots ranked second, and the untreated plots had low palatability.

For the period covered by these tests, about $35 worth of commercial dairy ration was needed to produce feed equal

TABLE I.—PASTURE RESPONSE ON PENN SHALE LOAM, 3-YEAR AVERAGE, 1936-1938 INCLUSIVE. FLEMINGTON, N. J.

Treatment	Condition of sod in 1938	Average percentage clover in 1938	Annual yield of dried clippings lb. per acre	Relative yields of herbage (%)
None	Fair	3	1,005	100
N only	Fair	Trace	1,647	164
Lime, N & P	Medium	Trace	1,750	174
Lime, NPK	Good	15	2,466	243
Lime, P	Medium	18	1,346	134
Lime, P & K	Very good	65	2,236	222

Rates of application: 1 ton limestone, 450 lb. 16% superphosphate, 150 lb. muriate of potash, all in alternate years. Nitrogen as 300 lb. nitrate of soda annually in March.
Clippings harvested every 2 weeks throughout the season.

in nutritive value to a ton of dried pasture clippings with 18% protein. It is clear, therefore, that pasture improvement was exceedingly profitable in all cases, provided the forage produced was actually utilized by the grazing herd.

The factor of seasonal production of herbage is a most important one in pasture management. Permanent pastures in general produce an abundance of feed in May and early June, but yield a scanty supply during the heat of summer. Since the surplus growth of spring becomes quite unpalatable if held over to mid-summer, the ideal treatment would be one which maintains rather uniform growth throughout the grazing season. Because of moisture shortage and unfavorable high temperatures in summer, this ideal cannot be attained with present-day vegetation. Other things being equal, treatments which produce a greater yield in midsummer may have greater value.

The seasonal distribution of feed shown by Table 3 indicates that a nitrogen fertilizer treatment in conjunc-

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TABLE II.—COMPARISON OF LIME-MINERALS-CLOVER AND THE LIME-MINERALS-NITROGEN SYSTEMS OF TREATING PERMANENT PASTURE ON WOODSTOWN LOAM SOIL. 3-YEAR TEST, NEW BRUNSWICK, N. J.

Treatment	Average clover in vegetation (%)	Annual yields of dried clippings (lb.)	% Protein content	Total cost per ton of clippings
1. None	22	1,308	15.0	$13.76*
2. LPK	36	1,921	18.8	12.60
3. LNPK	14	2,281	18.7	16.15
4. LNPK (Plus N in June)	6	2,466	18.7	17.78

Treatments once in 3 years: 1 ton limestone, 600 lb. 16% superphosphate, 150 lb. muriate of potash.
Annual treatments with nitrogen: 300 lb. sulfate of ammonia in March. June application—200 lb. sulfate of ammonia.
Annual acre costs: land use $4.00, mowing $2.00, fencing charges $1.25, labor applying fertilizers on LNPK plots $1.75, labor applying LPK once in 3 years $0.65.
Lime and fertilizer costs: actual values.

* When corrected for lower palatability, but not for lower protein content, this value should be $16.85 per ton of clippings.

Peter Volante in a field of celery being bleached by paper and by soil. When the papered celery is removed, that remaining will be banked higher.

Celery—Boston Style

By Robert E. Young

State College Field Station, Cedar Hill, Waltham, Massachusetts

THIS is the story of Peter Volante and how he grows his celery crop. He is one of the largest and most widely known celery growers in Massachusetts. His farm of 35 acres is in Newton Centre, surrounded on all sides by city homes. Last year, this farm produced 35 acres of celery, 3 acres of cabbage, 3 acres of broccoli, and 3 acres of spinach. Celery is produced for market from about June 15 to the last of November.

Mr. Volante starts all but the latest celery crop in the greenhouse. Inasmuch as the plants are grown in flats, a large amount of soil is required. This is prepared in the greenhouse as soon as the last spring crop is out. Peat is obtained from a nearby bog and is used along with soil and manure. After these are well mixed, a soil test is made and the proper amounts of lime and fertilizer are added. To make sure that the soil is in proper condition for plant growing, a crop of cucumbers is grown during the spring and summer, and radishes are grown in the fall. One look at the sturdy, well-rooted plants is enough to convince one that this thorough job of soil preparation is not money wasted.

The celery seed is sown in February in flats filled with soil from the greenhouse bed. When the plants are large enough to prick out, they are placed in other flats. The chief advantage of flats is that they can be moved to hotbeds and cold frames and the greenhouse used for other crops.

The preparation of the outside soil is as thorough as for the greenhouse. Very little manure is used, so when-

ever possible a fall crop of rye is planted to keep up the organic matter supply of this rather heavy soil. For the early celery crops, the land is plowed as soon as possible in the spring. Before the fertilizer is applied, the soils are tested to make sure about lime and fertilizer, and if lime is needed, it is applied and disked into the soil before the fertilizer is added.

Fertilizer and Water

There are two things Mr. Volante uses generously, fertilizer and water for irrigation. His average application of fertilizer per acre is one ton of an 8-16-14. This is much more than is used by other growers and probably more than the plants will use but, as Mr. Volante remarks, "It's results that count." During the past season, the amount of fertilizer was accidentally increased to 2,700 pounds of 8-16-14 on a small field which, when measured, contained only ⅞ of an acre. Of course, the use of this quantity of fertilizer was accompanied by generous amounts of water; none of the fertilizer is leached out of this rather heavy soil, as the subsoil is clay. The celery produced on this field was fully as good as that from the other fields.

After the fertilizer is applied and thoroughly mixed with the soil, the land is smoothed by machinery, for horses are no longer used. Their places are taken by three large tractors and two cultivating tractors.

The celery is planted by hand. The rows are spaced from 18 to 34 inches apart, depending upon the type of celery and the time of year, and the distance between plants in the row is 5 to 6 inches.

From the time the plants are up and well established until they are marketed, they are kept covered with Bordeaux. Mr. Volante uses home-mixed Bordeaux, because he feels it is cheaper and gives better protection. Each crop receives from six to eight applications of spray. Due to the narrow spacing of the rows and small fields with little room at the end of the rows, it is not possible to drive the sprayer over the field, and a boom is used which sprays three rows at a time. Two men, one on each side of the boom, walk up and down the rows, and they are assisted by one or two men handling the long length of hose necessary. Two spray machines are used. While one is supplying the spray, the other is being refilled. Mr. Volante goes to considerable trouble and expense to prevent celery blight.

All celery, except the Pascal in the fall, is bleached with paper. As the Boston market prefers celery well bleached, the applying of the bleach paper must be done correctly.

When the celery is ready for market, the paper is removed and the plants cut off with a U-shaped blade mounted on a two-wheeled hand cultivator. The plants are stripped of the outside leaves in the field, then removed to the packing shed. Mr. Volante feels that a grower's success or failure depends to a large extent on how his produce looks when it leaves the farm. It requires constant vigilance to see that the celery is packed as well as possible, and that it is the same from the top to the bottom of the box. He, or one of his two sons, may be found in the packing shed at all times.

Exacting Preparations

For the Boston market, the celery root is trimmed off and all the poor and green outside leaves are removed. The plants are then well washed to remove any dirt. The celery is wrapped in parchment paper—one, two, or three stalks to the bunch, depending on the size of the celery. (Eighteen such bunches must be large enough to fill a bushel box.) Until the last 2 or 3 years, celery was marketed in the bushel box, but now there is a special box holding one dozen bunches. Three layers of four bunches each are placed in the box, with chipped ice between each layer and on the top. When packing celery this way, Mr. Volante says six men in each crew will pack 30

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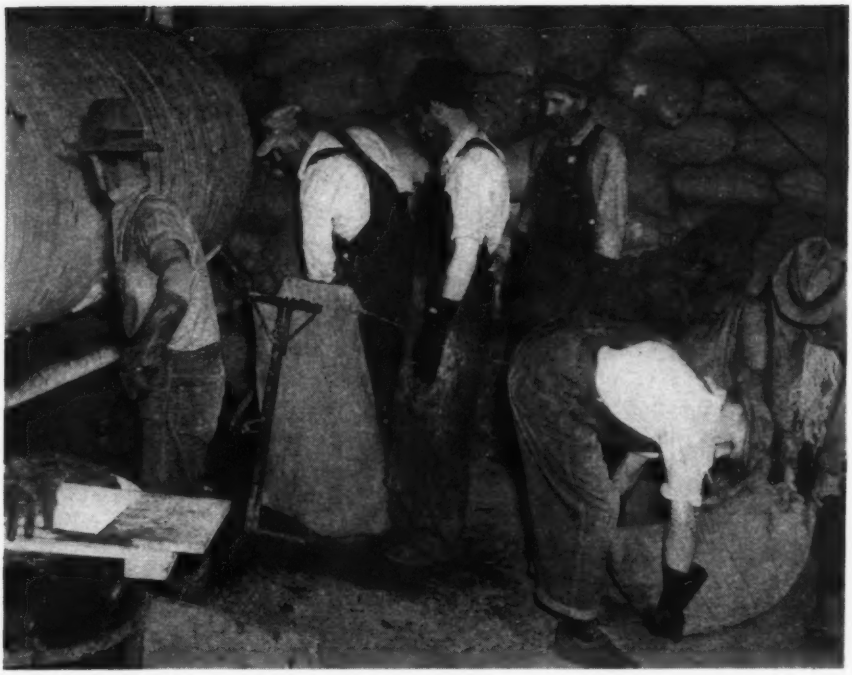
PICTORIAL

THE YOKE LOOKS STRONG, BUT THE SUSPENDERS—

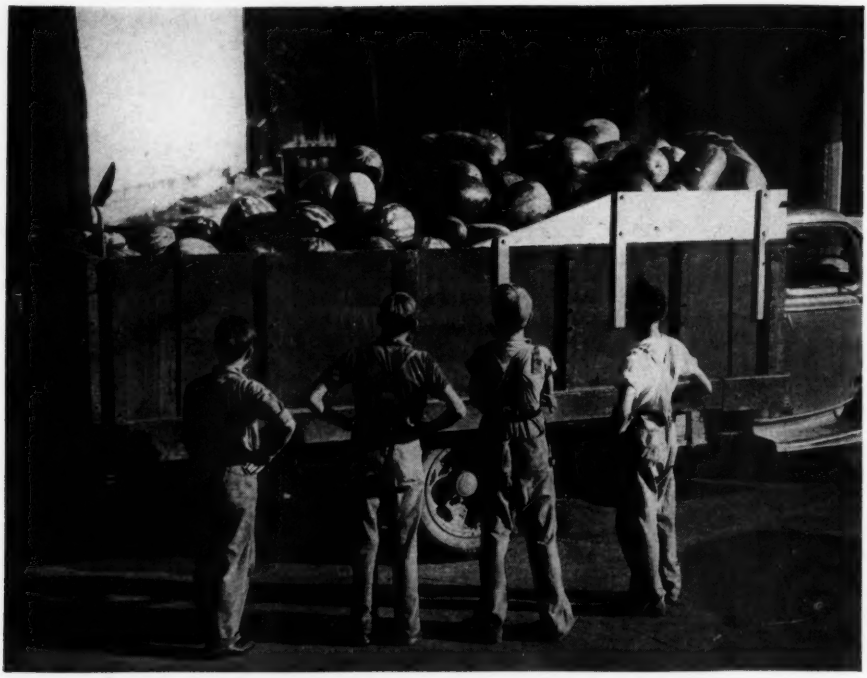
ABOVE: HOME CANNING HAS LARGELY ELIMINATED GARDEN SURPLUSES.

BELOW: A GOOD PLACE TO WASH—ON SUNNY DAYS.



ABOVE: SACKING GRASSHOPPER POISON IS A COMMUNITY ENTERPRISE.

BELOW: POLITICS? —AN EVEN DRAW, JUDGING FROM EXPRESSIONS.



ABOVE: TEMPTATIONS COME TO BOYS IN MANY SHAPES.

BELOW: A FAIR IS NOT A FAIR WITHOUT SOME KIND OF A RACE.

The Editors Talk

Farm Income 1940

A moderately favorable agricultural year seems to be in the making. The crop report of the U. S. Department of Agriculture shows that total crop acreage is about the same as last year, and only about 5% below the average for the last 10 years. Cotton acreage is a little above that of last year, but is 28% below the 10-year average. The situation with respect to tobacco is just the reverse, a 29% decrease from the large acreage of last year, but only a 14% drop from the 10-year average. Large percentage increases in acreage are shown for flax, barley, peanuts, soybeans, and cowpeas. While these all are minor crops, their aggregate acreage is rather large, and soybeans, which have been making phenomenal gains in recent years, are fast becoming a major crop.

The yields indicated are a little above average, so that total crop production should compare favorably with former years. Following a late spring, crops have made rapid progress, with ample moisture in most sections. In the lower Mississippi Valley, excessive rains damaged crops considerably, but favorable weather returned and prospects are good in this section also.

To complete the picture, crop prices must be considered, and here again the situation appears favorable. Prices of crops on the farm are above those of a year ago with few exceptions. Livestock prices have strengthened recently, so that total farm income may well be above that of last year. For the farmer to realize on his crops, it is important that the prices hold until he markets them. Many factors, national and international, may enter to influence the price situation. The international situation is unpredictable, being subject to possibilities of rapid and violent change. The national picture appears more stable, although likely to be influenced to some extent at least by the international situation. Industrial activity should be maintained at a good level due to the preparedness program getting under way and supplementing normal business. This should mean good demand for farm products, and move them at fair prices. The loan programs, crop insurance, soil conservation payments, and other agricultural programs of the government will add their important shares in helping farm income.

On the Whole, a Good Agricultural Year

Thus with crop production and prices at favorable levels, there is reason to look forward to a good agricultural year. It will not be a bonanza year, but probably a good one, with production in the case of most crops more in line with actual consumption needs than in some years in the past. There are still many problems facing agriculture which will have to be solved, but these probably are not going to affect the picture enough to bother most farmers during the immediate future.

The loss of export markets will add to stocks of cotton and tobacco on hand, and apple growers will have to dispose of a crop fortunately somewhat lower than

last year's with little prospect of much foreign buying. The tobacco and apple problems appear to be the most immediately important, but early tobacco markets have been holding up well. Apple growers undoubtedly will have to dispose of a larger part of their crop through the canner, which, although not as attractive as the fresh market, moves the crop quickly and with less trouble.

It would appear as though an appraisal of the agricultural situation thus warrants a moderately optimistic view of the coming year, which should be accompanied by thought for the future, with the realization that the problems involved must be faced and cannot be indefinitely postponed into the future.

The Potash Situation

After carefully surveying the world situation with respect to supplies of potash, the U. S. Department of the Interior finds that there is no danger of a potash shortage in this country. Our domestic industry has developed to the point of production where, with its self-imposed embargo on exports, coupled with what imported stocks are available, it can fully meet our potash needs.

For those who may have wondered what effect the present war in Europe is having on potash supplies essential to American agriculture, this is good news. It is contained in a new information circular I. C. 7117 "Potash Situation" of the U. S. Department of the Interior.

According to the circular, as potash is more necessary to the agricultural economy of the United States now than ever before, it is gratifying to find that the virtual stoppage of imports from Europe in late 1939 caused none of the anxious foreboding that gripped American farmers in 1914. For long decades prior to 1914 this country, in common with the rest of the world, depended upon European potash, but today our expanded needs can be met from domestic sources.

Therefore, whatever the turn of events in Europe, American agriculture is assured of adequate supplies of this essential plant food. Realization of the need for potash in many sections of the United States where it was not previously considered necessary has grown rapidly during the past few years and will continue to grow as these soils are farmed longer and more soils are tested for available potash. In maintaining the fertility of American soils and supporting the most efficient use of fertilizers, there need be no curtailment in official recommendation or grower use of potash wherever it has been shown advantageous and profitable.

THE government is spending billions for defense against the possibility of alien enemies, but protection from the evergrowing enemies within our borders, the destroyers of soil, has been inadequate. In one case we act vigorously because propaganda stirs our imagination, while in the other we neglect real menaces, because few laymen visualize or understand them—J. K. Newman, *A New National Enterprise, November 1939.*

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ New Hampshire Experiment Station Bulletin 320, entitled, "Pasture Top-Dressing in New Hampshire," by F. S. Prince, G. P. Percival, P. T. Blood, and P. N. Scripture, summarizes the experimental results obtained for a number of years by top-dressing fertilizers and lime on old pasture sods. As an average, $1 invested in fertilizers used for the pastures under test brought in about $2 worth of feed. Such a return, according to the authors, appears to warrant the use of this method of improving the income on dairy farms. Kind of soil, rate of application, and the choice of materials are factors that will influence the economy of fertilizer usage.

One ton of lime per acre every 5 or 8 years, 200-300 pounds of 47% or 500-700 pounds of 20% superphosphate every 3rd or 4th year, 100-200 pounds of 60% muriate of potash every 3rd or 4th year or in divided applications, and 150-250 pounds of some nitrogen carrier annually are considered reasonable amounts of materials to apply. If complete fertilizers are to be used, annual applications are preferable in amounts approximating 200 to 400 pounds of an 8-16-16 fertilizer, or if less nitrogen is required similar amounts of 4-16-20 may be used.

It is suggested that farmers who do not have suitable pasture soils for improvement or those whose acreage is limited will need to practice other methods to get more summer roughage. Pasturing rotation fields, reseeding tillable pastures, the use of annual crops for pasture, and utilizing grasses and legumes for silage are tested methods which may be adopted as individual conditions warrant.

"Fertilizers for Various Crops," Agr. Supplies Bd., Ottawa, Can., War-time Production Series, Sp. Pamphlet, No. 25.

"Fertilizing for Hybrid Corn, Some 1938 Results," Agr. Exp. Sta., Urbana, Ill., AG678, Apr. 1939, A. L. Lang.

"Fertility Balance, A Simple Method of Computing the Approximate Income and Outgo of Essential Plant Food Nutrients on Rotation Crop Land Under Any Plan of Farm Management," Agr. Ext. Serv., Lafayette, Ind., Ext. Bul. 244, Feb. 1940, Frank H. Demaree.

"The Farm as a Unit," Agr. Ext. Serv., University, La., Ext. Cir. 199, Jan. 1940, Wm. L. Roark.

"Neutral Versus Acid Fertilizer," Agr. Exp. Sta., State College, Miss., Bul. 338, Feb. 1940, J. L. Anthony, John Pitner, and Clarence Dorman.

"Comparative Values of Green Manures and Nitrate of Soda as Measured by the Growth of Small Grains," Agr. Exp. Sta., New Brunswick, N. J., Bul. 677, Apr. 1940, A. W. Blair and A. L. Prince.

"Fertilizer Experiments with Tomatoes, 1919-39," Agr. Exp. Sta., State College, Pa., Bul. 393, Apr. 1940, Warren B. Mack, G. J. Stout, and E. M. Rahn.

"Cotton Fertilizer Practices in Tennessee," Agr. Exp. Sta., Knoxville, Tenn., Rural Res. Series, Monograph No. 98, Nov. 20, 1939, Charles E. Allred and Benjamin D. Raskopf.

Soils

¶ Technical Bulletin 341, entitled "Distribution of Macro and Micro Elements in Some Soils of Peninsular Florida," by L. H. Rogers, O. E. Gall, L. W. Gaddum, and R. M. Barnette, contains interesting and instructive information on the chemistry of Florida soils. In this work samples from 89 cultivated and 43 virgin soils were utilized. In the investigation reported, macro ele-

ments are arbitrarily defined as those elements which were determined chemically and micro elements those determined spectrographically. Soils were analyzed chemically for nitrogen, calcium, magnesium, potassium, iron, aluminum, phosphorus, and insoluble matter (sand and silica). Analyses for 27 micro elements were made, these including copper, boron, zinc, manganese, arsenic, antimony, bismuth, etc.

Of the elements studied none showed as retentive properties as did phosphorus. In all cultivated soils there was found an increased percentage of phosphorus over that found in the corresponding virgin soil. Most soil samples were low in calcium, magnesium, and postassium. The micro elements were detected more consistently in the soils having poor drainage. The proportions of micro elements occurring in soils having poor drainage were also, as a rule, greater than or equal to the proportions of micro elements occurring in soils having good drainage, according to the authors.

"Tobacco Soils and Fertilizers," Dept. of Agr., Exp. Farms Serv., Ottawa, Ont., Can., Pub. 703, Cir. 167, April 1940.

"Peat and Swamp Muck for Soil Improvement in Connecticut," Agr. Exp. Sta., New Haven, Conn., Cir. 142, May 1940, M. F. Morgan.

"The Comparative Effects of Soils, Fertilizers and Systems of Soil Treatment on Crop Yields," Agr. Ext. Serv., Urbana, Ill., AG695, June 1939, F. C. Bauer.

"Making the Soil Building Practices of the Agricultural Conservation Program More Effective," Agr. Ext. Serv., Lafayette, Ind., Ext. Bul. 245, Apr. 1940, Russell Shipman, M. O. Pence, T. E. Shaw, and Monroe McCown.

"Contour Farming for Soil and Water Conservation," Agr. Ext. Serv., Ames, Iowa, Bul. P11, April 1940, C. H. Van Vlack and L. E. Clapp.

"A Key to Massachusetts Soils," Agr. Ext. Serv., Amherst, Mass., Sp. Cir. 64, June 1940, A. B. Beaumont.

"The Effect of 1936 Flood Deposits on Vermont Farm Lands," Agr. Exp. Sta., Burlington, Vt., Bul. 445, Mar. 1939, D. E. Dunklee and A. R. Midgley.

"Soil Building Practices for Wisconsin under the 1940 Agricultural Conservation Program," Agr. Ext. Serv., Madison, Wis., Sp. Cir., Feb. 1940.

"A Survey and Discussion of Lysimeters and a Bibliography on Their Construction and Performance," U. S. D. A., Washington, D. C., Misc. Pub. 372, May 1940, Helmut Kohnke, F. R. Dreibelbis, and J. M. Davidson.

"Soil Survey, Otsego County, New York," U. S. D. A., Washington, D. C., Series 1934, No. 17, Feb. 1940, W. E. Tharp, Clarence Lounsbury, W. W. Reitz, C. H. Diebold, A. J. Bauer, and D. F. Kinsman.

"Soil Survey, Major County, Oklahoma," U. S. D. A., Washington, D. C., Series 1936, No. 2, Mar. 1940, W. H. Buckhannan, O. H. Brensing, and C. F. Fisher.

"Soil Survey, Albemarle County, Virginia," U. S. D. A., Washington, D. C., Series 1935, No. 14, Mar. 1940, R. E. Devereux, B. H. Williams, and Edward Shulkcum.

Crops

¶ "Control of Blackfire of Tobacco in Western Kentucky", is the title of Kentucky Agricultural Experiment Station Bulletin 399, by E. M. Johnson and W. D. Valleau. In the discussion, "blackfire" is the term used in describing the late-season spotting of tobacco which occurs after topping and suckering. The disease is characterized by the presence on the leaves of dead, brown, zonate spots of various shapes, one-quarter to several inches in diameter. The spotting is caused by a combination of wet weather, low soil fertility, and infection with either *Bacterium tabacum* or *Bacterium angulatum*. Losses as great as 50% on many farms are caused by the leaf spot diseases, depending on the amount of rainfall, but some loss occurs every year even when rainfall is below normal.

Bordeaux treatment should always be used in tobacco beds because it is easy to apply and is almost certain to produce plants free from wildfire and angular leaf spot. Common observation has shown that early-maturing tobacco plants topped low (10-12 leaves) are more susceptible to blackfire injury than those topped high (16-20 leaves). Some dark-tobacco growers contend, according to the authors, that dark tobacco topped higher than 12 leaves will not cure with sufficient body, which is probably true for most dark-tobacco soils as they are managed. With proper soil management, heavy manuring and fertilization, the height of topping can be increased over that now commonly

employed, with resultant higher yields and freedom from blackfire. The soil should contain liberal quantities of available phosphorus, nitrogen, and potassium. An actual or partial deficiency of potash has been recognized as one of the causes of susceptibility to destructive leaf diseases.

The survey of tobaco soils reported proves that very few fields in which tobacco is grown contain sufficient available nutrients to produce a satisfactory crop. In western Kentucky where blackfire damage is high, tests show that more than 80% of the fields are too low in phosphorus and potassium for favorable growth of tobacco. This condition, especially the low potassium content, increases the susceptibility of plants to injury. A combination of Bordeaux treatment of plant beds and the best soil practices, as discussed in the bulletin, must be followed if high yields of relatively disease free, high-quality tobacco are to be obtained.

"4-H Club Manual in Cotton Production," Agr. Ext. Serv., Fayetteville, Ark., Ext. Cir. 160, Feb. 1940, C. A. Vines.

"Effects of Inbreeding Cotton With Special Reference to Staple Length and Lint Percentage," Agr. Exp. Sta., Fayetteville, Ark., Bul. 387, Mar. 1940, L. M. Humphrey.

"The Production of Strawberries in California," Agr. Ext. Serv., Berkeley, Calif., Cir. 113, Dec. 1939, Harold E. Thomas.

"Improved Pasture Crops and Pasture Practices for Central Alberta," Dept. of Agr., Exp. Farms Serv., Lacombe, Alberta, Can., Pub. 693, Farmers' Bul. 93, Mar. 1940, F. H. Reed and G. E. Delong.

"The Vegetable Garden," Dept. of Agr., Exp. Farms Serv., Ottawa, Can., Pub. 684, Farmers' Bul. 91, Mar. 1940, W. S. Blair, and T. F. Ritchie.

"Field Roots in Canada," Dept. of Agr., Exp. Farms Serv., Ottawa, Can., Pub. 672, Farmers' Bul. 88, Feb. 1940.

"Diseases of Tobacco in Canada," Dept. of Agr., Ottawa, Can., Pub. 667, Farmers' Bul. 85, Mar. 1940, G. H. Berkeley and L. W. Koch.

"Results of Experiments for the Years 1931 to 1938," Dept. of Agr., Exp. Farms Serv., Ottawa, Can.

"Diseases of Swede Turnips," Agr. Supplies Board, Ottawa, Can., War-time Production Series, Sp. Pam. No. 24, 1940.

"Latest Information on Production of Canning Tomatoes," Ont. Agr. Col., Guelph, Ont., Ext. Cir. 52, Feb. 1940.

"Report of the Department of Agriculture, Province of Nova Scotia, for the Year Ended Nov. 30, 1939," Dept. of Agr., Halifax, Nova Scotia, Can., 1940.

"Orchard Management in Colorado," Agr. Exp. Sta., Fort Collins, Colo., Bul. 458, Jan. 1940, E. P. Sandsten, F. M. Green, and L. R. Bryant.

"Tobacco Substation at Windsor Report for 1939," Agr. Exp. Sta., New Haven, Conn., Bul. 433, Mar. 1940, P. J. Anderson, T. R. Swanback, and O. E. Street.

"Annual Report for the Fiscal Year Ending June 30, 1939," Agr. Exp. Sta., Gainesville, Fla.

"Seasonal Occurrence of Tomato Diseases in Florida," Agr. Exp. Sta., Gainesville, Fla., Bul. 345, June 1940, George F. Weber and David G. A. Kelbert.

"Pastures for Georgia," Agr. Ext. Serv., Athens, Ga., Bul. 457, Feb. 1940, E. D. Alexander.

"Getting Better Stands of Legumes and Grasses for Soil Conservation," Agr. Ext. Serv., Urbana, Ill., AG792, Feb. 1940, E. D. Walker and J. C. Hackleman.

"Sweet-corn Hybrids for Canning and Market," Agr. Ext. Serv., Urbana, Ill., Cir. 504, May 1940, W. A. Huelsen.

"Peony Studies," Agr. Exp. Sta., Lafayette, Ind., Bul. 444, April 1940, E. R. Honeywell, F. C. Gaylord, and K. I. Fawcett.

"Sudan Grass," Agr. Ext. Serv., Lafayette, Ind., Leaf. 188, Apr. 1940, R. R. Mulvey.

"Essentials of Alfalfa Production," Agr. Ext. Serv., Lafayette, Ind., Ext. Bul. 242, July 1939, M. O. Pence.

"Pruning Fruit Trees," Agr. Ext. Serv., Ames, Iowa, Bul. P10, April 1940, S. W. Edgecombe.

"Potato Project for 4-H Club Members," Agr. Ext. Serv., Lexington, Ky., Cir. 100, Dec. 1939, John S. Gardner.

"Fifty-second Annual Report, University of Kentucky Agricultural Experiment Station, for the Year 1939, Part 1, Report of the Director," Agr. Exp. Sta., Lexington, Ky.

"Cotton Growing for 4-H Club Members," Agr. Ext. Serv., University, La., Ext. Cir. 160, Mar. 1939, R. A. Wasson.

"Report of Progress for Year Ending June 30, 1939," Agr. Exp. Sta., Orono, Me., Bul. 397, June 1939.

"The McIntosh Drop," Agr. Exp. Sta., Amherst, Mass., Bul. 372, May 1940, Lawrence Southwick.

"Growing Raspberries for Home Use," Agr. Ext. Serv., Univ. Farm, St. Paul, Minn., Ext. Bul. 206, Jan. 1940, E. M. Hunt.

"Growing Tree Fruits on the Farm," Agr. Ext. Serv., Univ. Farm, St. Paul, Minn., Ext. Bul. 205, Dec. 1939, E. M. Hunt.

"Corn Varieties in Mississippi," Agr. Exp. Sta., Miss. State College, State College, Miss., Bul. 339, Mar. 1940, C. R. Owen.

"Growing Gooseberries and Currants," Agr. Exp. Sta., Columbia, Mo., Cir. 208, June 1940, H. G. Swartwout.

"Legumes, Grasses, and Cereal Crops for Silage," Agr. Exp. Sta., Columbia, Mo., Cir. 209, June 1940, A. C. Ragsdale and H. A. Herman.

"Organization for Agricultural Research and Problems under Investigation, Forty-fifth Annual Report of the Montana Agricultural Experiment Station, July 1, 1937 to June 30, 1938," Agr. Exp. Sta., Bozeman, Mont., Clyde McKee.

"Buffalo Grass for Lawns," Agr. Exp. Sta., Lincoln, Nebr., Cir. 63, May 1940, E. F. Frolik and F. D. Keim.

"Vegetative Composition and Grazing Capacity of a Typical Area of Nebraska Sandhill Range Land," Agr. Exp. Sta., Lincoln, Nebr., Res. Bul. 117, A. L. Frolik, and W. O. Shepherd.

"B, Its Use As a Growth Regulating Substance for Green Plants," Agr. Exp. Sta., New Brunswick, N. J., Cir. 399, Apr. 1940, John W. Shive.

"Fifty-second Annual Report, 1939, Cornell University Agricultural Experiment Station, New York State College of Agriculture at Cornell University," Agr. Exp. Sta., Ithaca, N. Y., 1939.

"Forest-site Quality Studies in the Adirondacks. 1. Tree Growth as Related to Soil Morphology," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Memoir 229, Feb. 1940, Roy L. Donahue.

"1939 Report Cotton Variety Tests in Oklahoma," Agr. Exp. Sta., Stillwater, Okla., Cir. 87, Mar. 1940.

"The 'Why' of Wheat Improvement," Agr. Exp. Sta., Stillwater, Okla., Exp. Sta. Cir. 90, May 1940, Frederic T. Dines.

"After Harvest Care of Strawberry Plants," Agr. Ext. Serv., Corvallis, Oreg., Ext. Cir. 328, June 1939, O. T. McWhorter and Wm. F. Cyrus.

"Gladiolus Culture," Agr. Ext. Serv., Corvallis, Oreg., Ext. Cir. 329, June 1939, W. P. Duruz.

"Growing Early Vegetable Plants Under Glass," Agr. Ext. Serv., Corvallis, Oreg., Ext. Cir. 342, Jan. 1940, A. G. B. Bouquet.

"Sweet Corn Growing and Marketing," Agr. Ext. Serv., Corvallis, Oreg., Ext. Cir. 344, Jan. 1940, A. G. B. Bouquet.

"Growing Cannery Beets," Agr. Ext. Serv., Corvallis, Oreg., Ext. Cir. 345, Jan. 1940, A. G. B. Bouquet.

"Growing and Marketing Green Peas," Agr. Ext. Serv., Corvallis, Oreg., Ext. Cir. 347, Jan. 1940, A. G. B. Bouquet.

"Annual Report for the Fiscal Year 1938-1939," Agr. Exp. Sta., Rio Piedras, P. R., 1939.

"Soybean Varieties for Hay and Grain," Agr. Exp. Sta., Kingston, R. I., Bul. 271, Aug. 1939, T. E. Odland and G. F. Lea.

"Early Cabbage Experiments," Agr. Exp. Sta., Kingston, R. I., Bul. 272, Aug. 1939, F. K. Crandall.

"Peanuts for Profit," Agr. Ext. Serv., Clemson, S. C., Ext. Cir., Mar. 1940, H. A. Woodle.

"Profitable Cotton Production under Boll Weevil Conditions," Agr. Ext. Serv., Clemson, S. C., Cir. 180, Jan. 1940.

"Fifty-first Annual Report, 1938," Agr. Exp. Sta., Knoxville, Tenn., 1939.

"Conservation and Use of Manure on Tennessee Farms," Agr. Ext. Serv., Knoxville, Tenn., Pub. 234, Apr. 1940, H. E. Hendricks.

"Steps in Growing Sudan Grass," Agr. Ext. Serv., College Station, Tex., C-154, 1940.

"Information for Virginia Fruit Growers 1940," Agr. Ext. Serv., Blacksburg, Va., Bul. 131, Jan. 1940.

"Grass Silage," Agr. Ext. Serv., Madison, Wis., Cir. 299, May 1940, G. Bohstedt, W. H. Peterson, and F. W. Duffee.

"Hybrid Corn Adaptation Trials in Wyoming in 1939," Agr. Exp. Sta., Laramie, Wyo., Bul. 236, Apr. 1940, William A. Riedl.

"Forty-ninth Annual Report of the University of Wyoming Agricultural Experiment Station," Laramie, Wyo.

"Twenty-five Years of Extension Work Under the Act of May 8, 1914," U. S. D. A., Washington, D. C., Ext. Serv. Cir. 310, May 1939, C. W. Warburton.

"Publications of the Extension Service United States Department of Agriculture," U. S. D. A., Washington, D. C., Ext. Serv. Cir. 323, Jan. 1940.

"A Study of Methods in Barley Breeding," U. S. D. A., Washington, D. C., Tech. Bul. 720, Feb. 1940, H. V. Harlan, M. L. Martini, Harland Stevens.

"Physiological Studies of Jerusalem—Artichoke Tubers With Special Reference to the Rest Period," U. S. D. A., Washington, D. C., Tech. Bul. 657, Nov. 1939, Clarence E. Steinbauer.

"Growing Barley for Malt and Feed," U. S. D. A., Washington, D. C., Farmers' Pub. 1732, Jan. 1940, H. V. Harlan and G. A. Wiebe.

"Workers in Subjects Pertaining to Agriculture in Land-grant Colleges and Experiment Stations, 1939-40," U. S. D. A., Washington, D. C., Misc. Pub. 378, Apr. 1940.

Economics

¶ According to Special Publication No. 173, "Commercial Fertilizers Agricultural Minerals for 1939," published by the Bureau of Chemistry, State of California, the fertilizer industry in that State has enjoyed a rather steady growth for the past 3 decades. The tonnage increased from about 45,000 tons in 1910 to a peak of 232,795 tons in 1937. In 1938 the tonnage declined to

208,353 tons but increased again in 1939 to 218,523 tons. In California the sale of materials represents a very large share of the total business. Of the total of 218,523 tons sold in 1939, 61,519 tons were in form of mixed goods and the balance was materials, the leading material being sulphate of ammonia with 66,364 tons. Between 1938 and 1939 the tonnage of mixed goods has not held its own as compared to the other materials. The total volume of business increased about 10,000 tons between 1938 and 1939, but the sales of mixed fertilizers declined a little better than 5,000 tons. The sale of potash salts reached a peak of 2,492 tons in 1939.

¶ Especially interesting to the fertilizer industry is Purdue University Agricultural Experiment Station Bulletin No. 442 entitled, "Economic Considerations in Growing Canning Factory Tomatoes in Northwestern Indiana." This is a joint contribution from the Departments of Farm Management and Horticulture, and authors Marvin G. Smith and Lynn Robertson have analyzed 207 records obtained in Lake and Porter Counties in Indiana, with reference to harvesting, marketing costs, effect of yields on profits and costs, influences of fertilizers, and other factors in the production of tomatoes.

It was discovered that the harvesting and marketing costs varied with yield, but that growing costs varied considerably from one farm to another, and the amount of fertilizer, manure, and labor used varied rather widely. The average yield ranged from .6 ton per acre in 1934 to 7.6 tons per acre in 1937, but nearly every year some growers got very low yields and some got very good yields. It was noted that the yields probably are the most influential item affecting net returns of tomato production. The light-colored upland soils produced about two-thirds as many tomatoes per acre as the dark upland soils, and net returns on the darker soils were higher than on the light soils. Best yields were obtained, as a rule, when the tomatoes followed legume, hay, or pasture crops.

With respect to the fertilizer practices on these farms, it was noted that an average of $4.18 spent for fertilizer returned the greatest profit, and that on the average it was better than the high fertilizer expenditure and much better than low fertilizer expenditure. The rate of application varied on the individual farms from 100 to 800 pounds per acre. In 1934-35-38 the most common analysis used was 2-12-6, and in 1936 and 37 the most common analysis was 3-12-12. Other analyses used rather commonly were 0-12-12 and 20 per cent superphosphate, and it was the general opinion of the growers that fertilizers high in phosphate and potash and low in nitrogen were most desirable for tomatoes in this particular section.

Methods of application of the fertilizer varied somewhat, but most of the fertilizer was applied with the setter or corn planter in strips along the row. However, some growers applied it by hand at the hill, and others used the grain drill. The profit per acre on the farms using a comparatively small amount of fertilizer (an average of $2.02 per acre with 2.1 tons of manure) was $5.66, and the rate per hour of man labor expended was 33¢, whereas on the farms using a moderate amount of fertilizer ($4.18 per acre, with 1.9 tons of manure), the profit per acre was $10.20 and the return per hour of man labor was 38¢.

The higher fertilizer applications were not as successful as the moderate amounts, but it was noted that part of this was due to the fact that they had a very dry year in 1934, which threw the averages off somewhat and tended to show up the high fertilizer farmers to a disadvantage. This, of course, is one of the difficulties of simple averages in dealing with fertilizer application; the fertilizer used is not correlated with soil requirements or other factors essential to its successful use. There were undoubtedly farmers who used large amounts of fertilizer and obtained high profits, and probably some who used smaller amounts with good profit. This bulletin certainly presents some inter-

esting figures and facts and is well worth the study of both the fertilizer industry and the tomato growers.

"The Wholesale Marketing of Fresh Fruits and Vegetables in the City of Toronto," Dept. of Agr., Ottawa, Can., Pub. 673, Tech. Bul. 23, Feb. 1940, W. F. Chown and W. C. Hopper.

"The Fertilizer Trade in Canada, July 1, 1938—June 30, 1939," Dept. of Trade and Commerce, Dom. Bu. of Statis., Ottawa, Can., 99586-2, 1940.

"Seasonal Market Variations and Their Importance to Iowa Farmers," Agr. Ext. Serv., Ames, Iowa, Bul. P5, Mar. 1940, Eugene Hamilton.

"Balanced Agriculture in a Democracy," Agr. Ext. Serv., University, La., Ext. Cir. 201, Feb. 1940, J. W. Bateman.

"Type of Farming and Ranching Areas in New Mexico, Part 11," Agr. Exp. Sta., State College, N. Mex., Bul. 267, Dec. 1939, P. W. Cockerill, Byron Hunter, and H. B. Pingrey.

"Handling and Shipping Lettuce in New York," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 732, May 1940, Hans Platenius.

"Ohio Agricultural Statistics, 1938," Agr. Exp. Sta., Wooster, Ohio, Bul. 612, Mar. 1940, Glenn S. Ray, Oakley M. Frost, and P. P. Wallrabenstein.

"Adjusting Farm Management to Changing Economic Situations," Agr. Exp. Sta., Kingston, R. I., Bul. 274, Aug. 1939, J. L. Tennant.

"The Possibilities of Potato Growing as a Source of Vermont Farm Income," Agr. Ext. Serv., Burlington, Vt., Cir. 102, Apr. 1940, Hermon I. Miller.

"The Farm Lease and the Rental Contract," Agr. Ext. Serv., Madison, Wis., Cir. 303, May 1940, B. H. Hibbard and P. E. McNall.

"1940 Agricultural Conservation Program for Upshur County, West Virginia," U. S. D. A., AAA, Washington, D. C., ECR-406, Mar. 1940.

"Farm Production, Farm Disposition, and Value of Principal Field Crops 1937-1939," U. S. D. A., Washington, D. C., Apr. 1940.

"Farm Production, Farm Disposition, and Value of Certain Fruit and Nut Crops 1937-1939," U. S. D. A., Washington, D. C., May 1940.

"Agricultural Relief Measures Relating to the Raising of Farm Prices, 74th Congress, January 3, 1935 to June 20, 1936," U. S. D. A., Washington, D. C., April 1940, Agr. Ec. Bib. 84, Marion E. Wheeler and Mary G. Lacy.

"Land Classification, a Selected Bibliography," U. S. D. A., Washington, D. C., Agr. Ec. Bib. 83, Mar. 1940, Orval E. Goodsell and Walter M. Rudolph.

"Car-lot Shipments of Fruits and Vegetables by Commodities, States and Months (Including Boat Shipments Reduced to Car-lot Equivalents), Calendar Year 1939," U. S. D. A., Washington, D. C., Mar. 1940.

"New Mexico Handbook," U. S. D. A., AAA, Washington, D. C., 40-N. Mex.-1, Jan. 1940.

"North Dakota Handbook," U. S. D. A., AAA, Washington, D. C., 40-N. Dak.-1, Jan. 1940.

"Oregon Handbook," U. S. D. A., AAA, Washington, D. C., 40-Oreg.-1, Jan. 1940.

"Utah Handbook," U. S. D. A., AAA, Washington, D. C., 40-Utah-1, Dec. 1939.

"Washington Handbook," U. S. D. A., AAA, Washington, D. C., 40-Wash.-1, Dec. 1939.

"Wyoming Handbook," U. S. D. A., AAA, Washington, D. C., 40-Wyo.-1, Jan. 1940.

"1940 Range Conservation Program Bulletin," U. S. D. A., AAA, Washington, D. C., RCP-1940, Sept. 28, 1939.

"1940 Range Conservation Program," U. S. D. A., AAA, Washington, D. C., NCR-451, Jan. 2, 1940.

"Analysis of the Present Program of Research in the Economics of Soil Conservation and Suggestions for Its Improvement," U. S. D. A., Washington, D. C., Mar. 1940, Neil W. Johnson.

"Income Parity for Agriculture, Part 1.—Farm Income, Section 11.—Income from Potatoes, Calendar Years 1910-38," U. S. D. A., AAA, Washington, D. C., Mar. 1940.

"The Peanut Industry, A Selected List of References on the Economic Aspects of the Industry, 1920-1939," U. S. D. A., Washington, D. C., Agr. Ec. Bib. 80, Nov. 1939.

"Seven New Peaches and a New Plum for the Western States," U. S. D. A., Washington, D. C., Cir. 552, Feb. 1940, W. F. Wight.

"Care of Ornamental Trees and Shrubs," U. S. D. A., Washington, D. C., Farmers' Bul. 1826, Nov. 1939, Furman Lloyd Mulford.

"Kudzu for Erosion Control in the Southeast," U. S. D. A., Washington, D. C., Farmers' Bul. 1840, Dec. 1939, R. Y. Bailey.

"Potato Production in the Western States," U. S. D. A., Washington, D. C., Farmers' Bul. 1843, Mar. 1940, W. C. Edmundson.

"Comparative Susceptibility of Crop Plants to Sodium Chlorate Injury," U. S. D. A., Washington, D. C., Tech. Bul. 648, Jan. 1940, Annie M. Hurd-Karrer.

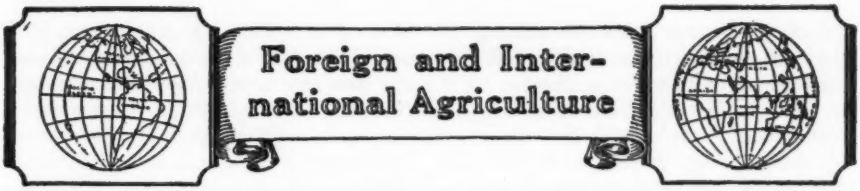
"Alfalfa Experiments at Stoneville, Miss., 1935–37," U. S. D. A., Washington, D. C., Tech. Bul. 701, Nov. 1939, Paul R. Henson and H. L. Westover.

Saleslady: "Now, madam, this is the best hat in the shop."

Customer: "I know it is, but I'd like a change. That's my old one."

He: "The doctor says bathing alone will not keep you healthy."

She: "Oh yeah! Well, just the same, I'll continue to bathe alone."



To supply information on agricultural research and practice in other countries, brief abstracts of articles in foreign publications are given here. Due to space limitations, only articles of general fundamental interest are included, although the publications may contain other articles and reviews.

Die Ernährung der Pflanze, Vol. 36, No. 3, March 1940

The Metabolic Physiological Study of Mineral Salt Deficiency with One-Celled Algae. *By A. Pirson, Berlin, Germany.*

Much fundamental information on the mechanics of metabolic processes of higher plants has been gained by studying similar activities in one or few-celled Algae. The simplicity of such organisms and the ease of controlling surrounding conditions and of studying their reactions, but at the same time the fundamental similarity of their life processes to higher organisms, make them well-suited for such work. The author therefore decided to use the one-celled Alga Chlorella to study the action of certain salts on the life processes of green plants. In this way the difficulty of obtaining information on the functions performed by elements such as iron or potassium not entering into compounds that are an integral part of the cell might be partially overcome by the possibility of making direct observations on the entire organism grown under carefully controlled conditions. The main differences of Chlorella from higher plants are their ability to grow on little or no calcium and to produce chlorophyll in the absence of light.

Ingenious apparatus for growing the organisms in pure condition and for controlling their environment are described. If the potassium in the nutrient medium was reduced by replacement with sodium, assimilative capacity, productivity, and chlorophyll content all decreased. Significant, however, was the greater decrease in assimilative capacity than in chlorophyll content. It was concluded from this that the photosynthetic capacity of the cells is reduced when potassium is deficient, not because of a decrease in chlorophyll, but due to an unknown factor interfering with the efficiency of the chlorophyll under these conditions.

Further indication of this was shown where the organisms were grown at three levels of potassium deficiency. When potassium salts were added to these cultures, assimilation by the cells increased remarkably fast, too quickly, in the opinion of the author, to permit it to be ascribed to increased cell or chlorophyll production. Later increases in assimilation undoubtedly were due to these factors in part at least. It is believed that this rapid action of potassium must be ascribed to its increasing the efficiency of the chlorophyll in some way. Sodium or lithium salts were not similarly effective.

Based on this work, the author gives as the progressive effects of increasing potassium deficiency on the Chlorella culture: primary photosynthetic retardation; deficiency of synthetic substances; disappearance of chlorophyll and protein; secondary photosynthetic retardation; photooxidation; irreversible disintegration. If potassium salts are added before the last stage has set in, the following reactions follow in order: primary stimulation in photosynthesis, independent of chlorophyll content; manufacture of new synthetic substances; production of new chlorophyll and protein; resultant increase in photosynthesis.

Similar series have been traced in potassium-deficient leaves, but in higher

plants the matter is complicated by the lack of potassium interfering with the movement of iron in the plants.

The influence of potassium is not concerned entirely with the supply of carbohydrates. If this were the case, supplying sugar to a plant such as Chlorella which can adapt itself to heterotrophic conditions, should repress potassium deficiency. This occurs to only a slight extent, leading to the assumption that other factors are involved, most likely nitrate reduction or protein synthesis. The relationship of potassium to photosynthetic activity is stressed, however, even though numerous other secondary factors may be involved.

The action of potassium in increasing the efficiency of chlorophyll could be duplicated by using rubidium or caesium, but not sodium or lithium. The production of chlorophyll was not possible with caesium, and less effective with rubidium, although it is possible to grow Chlorella with the complete substitution of rubidium for potassium. The mobilities of potassium, caesium, and rubidium ions in water are rather close together and higher than those of sodium and lithium, but it is not known whether this is the explanation for the former tending to act as a group in the nutrition of Chlorella.

To see whether the action of the alkali elements on the functioning of Chlorella was peculiar to them, similar work was conducted with nitrogen. Cultures that were deficient in nitrogen were given ammonium chloride. The assimilation did not increase, but decreased, although chlorophyll content gradually increased. When potassium nitrate was added, the rapid increase in assimilation occurred as described before for potassium. Since it is known that Chlorella can utilize ammonium nitrogen, its ineffectiveness in this case, in contrast to the effectiveness of potassium nitrate, would indicate that the action of increasing the efficiency of the cholorphyll is peculiar to potassium and to some extent to some of the other alkalies.

It was observed that nitrogen addition caused an increased consumption of oxygen, while the addition of potassium had the opposite effect, when added to cultures deficient in each element respectively. This would indicate that addition of nitrogen causes a shortage of respiratory material, while potassium addition conserves the carbohydrates.

The author feels much more work along these lines is needed, and especially more information on deficiency symptoms. He thinks that the action of the potassium on photosynthesis is due to a rapid physico-chemical reaction within the cell, possibly in the chloroplasts. It is considered significant that other work has shown that potassium tends to be localized in these bodies.

THE POTASH CONTENT OF MEADOW HAY FROM VARIOUS SOILS WITH AND WITHOUT FERTILIZATION. *By B. Tacke, Bremen, Germany.*

Information on the mineral content of hay is considered important for the purpose of determining replacement of soil nutrients, for measuring the nutrient needs of the soil, and for appraising the mineral nutrient value of the forage. At the Peat Experiment Station in Bremen, samples of hay from various peat, muck and marsh soils have been analyzed, and the response of the crops to fertilization has been measured over a long period of years. In general it has been found that hays growing on these soils, and well fertilized, would contain about 2% K_2O on an air-dry basis (15% H_2O). From this finding, a general rule has been drawn up that for each ton of air-dry hay removed from the soil, 40 pounds of potash (K_2O) should be returned to the soil in fertilizer.

The fertilizer experiments showed that when the hay contained less than 2% potash, there was likelihood of potash fertilization giving beneficial response. However, there were cases where good response was obtained from potash fertilization when the hay con-

tained more than this amount of potash, and in others, when the hay contained less than this amount, the response was not as great as might have been expected. The value of 2% K_2O therefore should be used only as a general guide, and not followed too implicitly in the matter of potash fertilization. The use of this value in the matter of fertilizer replacement, to prevent soil deterioration in potash supply is felt to be fully justified, and the author says there need be no fear of decline in hay yields if 40 pounds of potash are returned to the soil for each ton of hay removed, provided of course, that phosphoric acid and other factors necessary for a good crop are provided.

RAMIE—A NEW GERMAN FIBER PLANT? *By K. Vieweg, Berlin, Germany.*

Since Germany uses considerable fiber from the plant ramie, grown principally in Japan and southern Asia, an attempt was made to see whether it could be grown in Germany. Trials with the variety Boehmeria nivea, least exacting variety in its climatic requirements, were made in Baden, and later farther north. It was found that the plant would grow well in both places, although it was highly important that a protective covering of manure or some similar material be applied over the winter. When this was omitted, there was considerable winter injury which was apparent throughout the next season.

The luxuriant and rapid growth of the plant indicated that it had a high nutrient requirement. A fall fertilization of approximately 1,000 pounds of 13-9-25 per acre with a spring topdressing of 300 pounds of nitrate of soda was made and the growth compared to an area unfertilized. The plants with complete fertilizer produced more and longer canes, with some over 7 feet long. While the results of the trials were gratifying, it is recognized that the growing of ramie in Germany presents definite problems. Winter protection is one, and the fact that only one cutting a year can be made, compared to several in the tropics, is another. When the demand for the fiber is great, however, ramie does present a possibility of supplying some of the need.

RESULTS OF A MEADOW EXPERIMENT CONDUCTED BY THE DANISH HEATH SOCIETY FOR MANY YEARS ON PEAT SOIL.

Mixed meadows with different fertilizer treatments were harvested over a period of 8 years. Either phosphate or potash alone was not very effective in increasing yield, but both together tripled the hay yield when applied to unplowed land, and about quadrupled the yield when applied to plowed land. Nitrogen and lime were not very effective on these soils. The phosphate and potash treatment also increased the proportion of desirable grasses at the expense of weeds and undesirable grasses in the plots.

CHANGES IN ACIDITY AND ACTIVE ALUMINUM CONTENT OF PODSOL SOILS DUE TO FERTILIZATION. *By P. N. Koschelkow, Russia.*

In this abstract of Russian work it is brought out that sulphate of ammonia increased active aluminum in soils, phosphate carriers except basic slag had little effect, while cyanamide and basic slag decreased the active aluminum. The various potash fertilizers also had little effect on acidity or active aluminum, but showed a tendency to decrease the latter a little, without changing the pH.

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VARIATIONS OF THE BORON CONTENT OF LEAVES WITH AGE. *By G. Bertrand and L. Silberstein, France.*

Previous work by the authors on the distribution of boron in the different parts of the plant has shown that the leaves are richer in this element than other parts of the plant. In the lily, it was found that the leaves contained 10

ppm boron, while the plant as a whole contained only 4.2 ppm. Since the leaves are the organs of synthesis of the plant, this accumulation of boron in them suggested that it might play a positive role in these processes. If such is the case, the boron content of the leaf might be related to the activity of the leaf. Further work was therefore undertaken to determine the boron content of leaves at different periods in their development.

The leaves of five different plants were analyzed for their boron content at six different times during the season, from the middle of March to the end of July. The following trees and shrubs, all growing in the garden of the Pasteur Institute in Paris, were sampled: Aesculus hippocastanum L. (red flowered horse chestnut), Euonymus japonicus L. (Japanese spindle tree), Sorbus aucuparia L. (rowan tree), Syringa vulgaris L. (lilac), and Abies excelsa D.C. (Norway spruce).

In most cases the boron content of the bud was considerably higher than that of the young leaves after coming out. As the leaves became older, their boron content increased to a maximum at the end of April or May, followed by a more or less marked decrease. There were some exceptions to this, the boron in horse chestnut leaves continuing to increase up to the last sampling date. The spindle leaves when young were much higher in boron than the buds, but showed a decrease after the maximum period the end of April. The buds contained between 8 and 10 ppm dry matter, with the maximum during the season varying from 6.4-12.8 ppm. Thus there was considerable variation in the boron content of the various species.

The authors call attention to a similarity in the boron data to those obtained with manganese. For the most part, these elements are present in largest amounts when the leaves are most active. The accumulation of boron in older leaves they believe due possibly to the formation of less soluble compounds with calcium.

THE BORON CONTENT OF LEAVES OF BEETS AND OTHER PLANTS SUFFERING FROM A LACK OF BORON. *By G. Bertrand and L. Silberstein, France.*

For some time an arrested development of terminal or central bud growth, giving rise to a rosette-like development of the leaves, has been identified as due to a lack of boron in the plant. In the case of root crops, heart rot of the root also occurs. In continuation of the work on the boron content of leaves at different periods of growth, the authors analyzed leaves of various field crops. These included beans, beets, rutabagas and cabbage. Mature plants were sampled, but the leaves were separated on the basis of age. In nearly all cases, the leaves in the actively growing terminal or bud were highest in boron, and older leaves tended to be lower. Considerable variation was found among the leaves of the same species, and among the species. Young cabbage and bean leaves were highest, around 20 ppm dry matter, while the older leaves of beet and cabbage were lowest, around 7 ppm.

The authors call attention to the tendency of boron to be concentrated in the more active leaves in the case of field crops, the same as with trees and shrubs. When boron is lacking, these young leaves, having the greatest requirement of boron, show the effects of the lack most noticeably, giving rise to rosette and heart rot.

CONTRIBUTION TO THE STUDY OF THE CHEMICAL COMPOSITION OF FORAGE PLANTS. *By L. Maume, Montpellier, France.*

The author mentions the importance of the organic and inorganic composition of forage plants, both from the viewpoint of evaluating them for feed and as a guide as to the fertility status and fertilization needs of the soils on which the plants were grown. Samples of numerous grasses and legumes grown on different soils were analyzed and the results studied from the above angles by class of plant and type of soil.

The organic compounds analyzed were divided into three groups, the nitrogen compounds, including the amino acids, the polypeptids, and the proteids; lipoids or ether extract, including the fatty acid compounds; and glucosides or the various carbohydrates. The inorganic determinations included phosphorus, potassium, calcium, and magnesium. Alkalescence also was calculated by balancing the milliequivalents of CaO and MgO against P_2O_5 and dividing by the dry matter. Brief discussion is given on each of the factors to be taken into consideration in connection with the organic compound grouping.

In general the grasses were lower in nitrogen compounds than the legumes, and both groups of plants contained more nitrogen when grown on a richer soil, the difference being a little more marked in the case of the legumes. Lipoids were present in much lower quantities in the plants than the nitrogen and carbohydrate compounds, and consequently less importance is attached to them. They tended to be higher in the legumes than in most of the grasses, but there was overlapping in the values. While total carbohydrates did not differ much among the grasses and legumes, the material easily hydrolizable in 2% HCl was much higher in the grasses than in the legumes. The grasses also tended to be higher in cellulose.

The author states it is generally accepted that when a forage contains less than .28-.30% P_2O_5 in the air-dry plant (containing 14% moisture), the animals fed such forage are likely to suffer from effects of phosphorus deficiency. If the plants contain less than .69% P_2O_5, the soil is probably deficient in phosphoric acid, and favorable response in crop growth is likely to result from the use of phosphatic fertilizers. On these bases, many of the soils on which the plants were grown would be likely to respond to phosphatic fertilizers, but only a few samples were so low in phosphorus as to make them poor forage in this respect. There were no outstanding and consistent differences in the phosphorus contents of the grasses and legumes grown on the same soil.

In the case of potash, it is considered that when the plant contains less than 2.15% K_2O, the soil on which it was grown would be likely to respond to potash fertilization. The author, however, thinks this figure is possibly too low in the case of grasses, since cases were found where these plants responded well to potash fertilization, even though they already contained more than the above-mentioned amount of potash. In the sections sampled, one-third to one-half of the soils would appear to be low in potash even by the low standard given. In general, grasses were considerably higher in potash than the legumes. It was observed that usually the second and third cuttings of alfalfa were higher in phosphoric acid and potash than the first cutting.

The legumes were higher in calcium and magnesium than the grasses, with considerable variation among samples from different soils.

There was great variation in composition of plants with age and with soil on which they were growing. The author stresses the importance of taking these factors into consideration when analyzing plants, and in reporting the results.

"I don't like Bob. Last night I wanted to show him how well I could whistle, and when I puckered my lips real nice—"

"Well, what then?"

"He let me whistle."

Mr. Simms: "Say, do you know a fellow down your way with one leg named Wilson?"

Mr. Dubb (doubtfully): "Well now, I'm not sure. What's the name of the other leg?"

Celery—Boston Style

(*From page* 22)

dozen bunches per hour. He sends from 150 to 800 dozen bunches to market a day throughout the season, and figures his yield at about 1,500 dozen bunches per acre. One-third of the celery is sold to chain stores, and two-thirds is sold wholesale on the Boston market.

Peter Volante came to the United States from Italy in 1899. He started to work on this farm in Newton Centre in 1907, and took it over on his own in 1915. One of his outstanding characteristics is his open mind to new things, evidenced by his knowing when to ask for aid from local, State, and Federal vegetable specialists.

He had always grown Golden Plume for early and summer use, and Giant Pascal for late crop and for storage. His willingness to stop work and show some visiting growers his farm led them to swap celery seed with him, and the new type of celery proved to be well adapted to this region. It is a Pascal type yet can be bleached with paper or boards. Now, he has been growing this celery, which has been named Summer Pascal, for 3 years. It has brought a premium on the market of 50 to 100% more than the regular yellow celery. When grown in this section of the country, however, the new celery lacked the uniformity that characterized it in its home State, and with his cooperation breeding work to improve the strain was undertaken at the Waltham Field Station of the Massachusetts Agricultural Experiment Station. Although this work is still under way, the seed has already been released to growers.

Mr. Volante's outstanding practices in growing celery might be summarized as follows: (1) Set good plants on well-fertilized land. (2) Keep the crop growing with plenty of water (3) See to it that it is well put up when it leaves the farm.

Vegetable Crops

A Third Edition of H. C. Thompson's well-known book, "Vegetable Crops," has been issued ("Vegetable Crops," by H. C. Thompson, McGraw-Hill Book Company, Inc., New York, 1939, $5.00). To the many users of the previous editions of the book, it will be welcome news that they can now have a volume covering the various parts of the subject matter brought up to date by a thorough revision wherever necessary. In this new edition sections on soil erosion, quick tests for determining nutrient needs of soils, secondary elements of nutrition, fertilizer placement, pH values and relation to soil acidity, certified seed, and new insect control materials have been added, expanded, or largely rewritten. Many other changes, too numerous to mention here, also have been made. The new material has been included with only a slight increase in size of book, due to condensation and elimination of obsolescent material.

The general style and arrangement of the Third Edition of "Vegetable Crops" is similar to the Second Edition. Introductory chapters give the importance and classification of vegetables. The next four chapters deal with the soil and its improvement for growing vegetables, including tillage, erosion control, manure, green manures, cover crops, fertilizers, and lime. Following these, come chapters covering seed se-

lection and growing, plant growing in the open and under covers of various kinds, field planting, cultivation, irrigation, rotation, and intercropping, disease and insect control, marketing and storage. The remaining two-thirds of the book is devoted to individual vegetable crops, all of the common and most of the less common crops grown anywhere in North America being included. In connection with each crop, sections dealing with production data, history, classification, climatic and soil requirements, general fertilizer and lime recommendations, seeding or setting the crop, cultivation, disease and pest control, harvesting, packing, marketing, and other subject matter of particular significance to the crop are given. More space is devoted to the important than to the less important crops, since in general, much more is known about the former.

Dr. Thompson's book has been noted for its completeness and careful arrangement. These make it well suited as a text book and also reference and guide book for the teacher, adviser, and practical grower. In these respects, the new edition is even superior to the previous, and it should enjoy popularity in like degree.

Permanent Pasture Treatments Compared

(*From page* 20)

TABLE III.—SEASONAL DISTRIBUTION OF HERBAGE GROWTH AS AFFECTED BY TREATMENT. 3-YEAR AVERAGE, NEW BRUNSWICK, N. J.

Soil Treatment	Before May 1	Before June 15	June 15 to Aug. 15	After Aug. 15	Total for season
	Yields of dried clippings lb. per acre				
None	164	600	435	273	1,308
LPK	252	881	626	414	1,921
LNPK	555	1,354	552	375	2,281
LNPK (Plus N in June)	619	1,366	730	370	2,466
	Relative yields of herbage (%)				
None	100	100	100	100	100
LPK	154	147	144	152	147
LNPK	338	226	127	137	174
LNPK (Plus N in June)	377	228	168	136	189

tion with lime and minerals is of greatest value for very early growth. The yields of herbage in April were more than three times as great under nitrogen treatments as with no fertilizer, and more than twice as great as with lime and minerals. This superiority of nitrogen treatments was maintained up to June 15. For the balance of the season, at those times when pastures are normally the shortest and feed is needed the most, the LPK treatment which stimulated clover was the most effective.

These results should not be interpreted to mean that nitrogenous fertilizers have no place in pasture management. On the contrary, unless clover or a similar legume can be made an important part of the pasture sod, there is no alternative to the liberal use of nitrogen fertilizers. Moreover, such fertilizers will provide feed on pastures 2

to 3 weeks earlier than would otherwise be possible, and thus reduce barn feeding accordingly. The surplus feed on fertilized pastures of all types may be cut in late May or early June and preserved as hay or as grass silage. In either case, this feed is available to feed livestock during the summer shortage of pasture.

The type of pasture treatment should be chosen to suit the need for feed. On farms with limited acreage for pasture, a greater net gain to the farm might be obtained from the more intensive system of treatment with its higher yields, provided all of the feed so produced could be used effectively. On farms with more adequate pasture acreage, the treatment with lime and minerals (without nitrogen), which brings in clover, would be the most profitable. Perhaps the best system on many farms would be the use of heavy nitrogen fertilization (balanced with lime, phosphate, and potash) on a portion of the pasture for early grazing, and the use of lime, phosphate, and potash to stimulate clover on the remainder. In any system, it is highly essential that the utilization of feed by grazing and harvest keep pace with herbage growth, if the full value of pasture is to be obtained.

Pioneers—1939 Model

(*From page* 16)

of cleared land. This spring he has 25 acres of alfalfa and 14 acres of alsike. He has seeded 15 acres of alfalfa with flax as a nurse crop. He knows, now, that he can make a living with something to spare. Last year, he sold $259 worth of alsike and clover seed from 19 acres of his land, and harvested 117 bushels of wheat from 11½ acres, and 97 bushels of oats from 9 acres.

Then, there's Frank Wyman, a short, cheerful man who looks much younger than his 62 years. Wyman is a bachelor who formerly lived deep in the woods where he did a lot of hunting, trapping, and berry picking.

Wyman "relocated" on 80 acres of wild land, grown up to a tangle of trees and brush, 3 miles north of Roosevelt in the spring of 1926. The Government has loaned him a total of $1,602, $650 for land, $385 for chattels, and $567 for breaking and grubstake. He has repaid $102.75, leaving a balance due of $1,500.25. Today, 65 acres of Wyman's "80" are cleared. He lives in a little shanty, his only other building being a temporary shelter for his team.

"I plan to build my buildings from the income I get from the land, and right now I'm putting what I make back into the farm, into additional clearings, and so on," he explained. "I'd rather do that than go into debt on buildings."

Wyman is concentrating on alsike and alfalfa seed production. Last year, his alsike won first place at the Minnesota State Fair and fourth place at the Chicago International. He made $700 from his seed last year and is fairly certain of selling at least that much this year.

Evidence of the character of the man is the fact that Wyman is now paying back a compromise mortgage on his former farm, despite the fact that the land was forfeited for delinquent taxes, which automatically canceled the mortgage. The 1937 Minnesota law, permitting owners to buy back tax delinquent land for 60 per cent of the delinquency, was taken advantage of by Wyman when a friend went his note,—and he then "traded it in" on the new farm. He considers it a "matter of simply honesty," under the circumstances, to pay back the compromise mortgage.

These people are representative of Wilson's "good risks." Over 200 farm families have been bought out and relocated through the Government resettlement work in the 1,500,000-acre area, and practically all of the loans they received from the Government are being paid back.

Facts and Figures

Back in the office at Baudette, Wilson trotted out facts and figures. For example, of the $29,000 that should have been collected in one county by one of Wilson's associates last fall, $27,200 was actually received, and the balance is not "in doubt."

Several settlers have paid back all that they borrowed, and many others will be paid up by the end of the year. Substantial savings in county tax money have been effected by the removal of settlers from the "big bog"; counties have been enabled to close roads and schools which they formerly maintained in the wilderness area. Measured in human terms, the value of the project is incalculable.

"I get an enormous kick out of riding through this Rainy River country, seeing farmers working out their destiny on land that, just 4 years ago, grew only brush and poor timber," Wilson told me as we sat in his office, papers spread over the desk before us. "It does a lot for my faith in human nature to see these fellows come back, after taking just about as bad a beating from fate as a man can take. They're the stuff our Nation was built of, the pioneers of our last agricultural frontier."

"We didn't give those people anything but a fair chance," he said. "We bet money on 'em—sure, we did. We bet they'd make good. And they have. They've won our bet for us." He went on to give more facts and figures. The average cash income of farmers in the old wilderness area was around $320 per year. In their new locations, the farmers are averaging considerably better than $1,000 a year. The prosperity of such towns as Baudette and Warroad is being boosted.

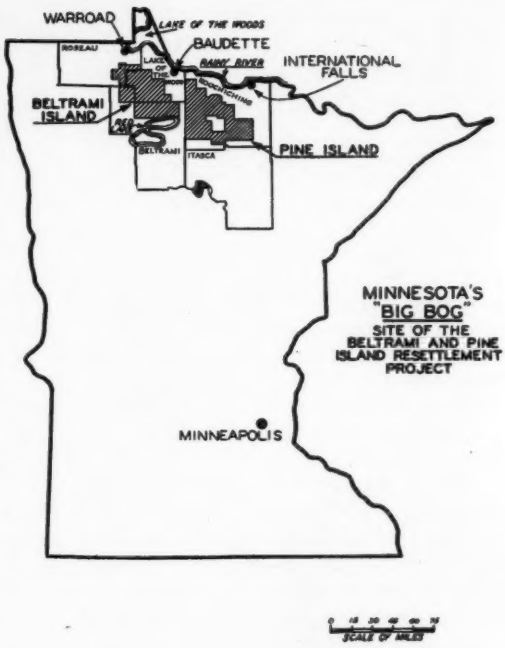
What of the land the farmers left? It is being developed by the land utilization division of the Soil Conservation Service for the uses to which it is naturally fitted, timber and wildlife production. In the 1,500,000-acre area, drainage ditches are being blocked to

Fire is at once the great friend and the great enemy of the north country. For clearing good land, fire is indispensable. But deep in the woods, soil is so poor that clearing by fire simply creates an unnecessary hazard.

raise the water table, wildlife food and cover plantings made, truck lanes built to aid in fire control, forest ranger towers and cabins erected, and telephone lines built to provide communication between ranger stations.

Fire is the great enemy of the country, and with the removal of settlers fire hazards have been greatly reduced. Settlers of necessity cleared their land with fire. No other type of clearing is economically possible. And those fires frequently got out of control.

Since development work was started, wildlife populations have been greatly increased. Waterfowl populations have been increased from three to five times in the last 3 years, deer populations have trebled, beaver has trebled, and populations of other aquatic furbearers, otter and muskrat have doubled.



Nature has been given a chance. Men have been given a chance. Throughout the north country today we see man and nature working together, supplementing each other, supporting each other. Out of the chaos of haphazard settlement and exploitation, order, based on wise land use, is emerging. Zoning ordinances will prevent a repetition of former mistakes. It's a country, now, with a future!

Breeding Vegetables for the South

(*From page* 12)

addition the members of the committee, in the case of the Charleston laboratory, cooperate in the growing and testing of the new types and strains which are developed at the laboratory.

In this way types which are promising are tested under the various soil and climatic conditions throughout the southern States. Also strains which are not particularly promising at Charleston may be tested to determine if they are of any value under conditions prevailing in other localities. In this way the State experiment stations keep in touch with the work of the laboratory and have an opportunity to be of much assistance in its program of breeding better varieties of vegetables.

The meetings of the advisory committee at the laboratory have developed into valuable symposia on vegetable breeding. The collaborators from the various State experiment stations and the representatives of the laboratory and the U. S. Department of Agriculture present their experiences, methods, and ideas for the benefit of every one. It is felt that this pooling of information by those working in this field is

certain to result in more rapid progress in breeding than could be achieved in any other way.

At the first meeting of the advisory committee early in 1936, it was decided that the laboratory should devote its efforts chiefly to the breeding of four crops: tomatoes, cabbage, snap beans, and watermelons. Last year a fifth crop, sweet corn, was added to this list. In addition to work on these five crops, which requires practically the full time of the staff, considerable breeding work upon several vegetable and floral crops is being carried on at the laboratory by other scientists of the Bureau of Plant Industry. This work is not financed with laboratory funds, but with funds appropriated to the Bureau for its regular activities. This work involves the breeding, selection, and testing of varieties and strains of Irish potatoes, peas, onions, garlic, shallots, lilies, chrysanthemums, and azaleas.

In the case of tomatoes, the aim of the breeding program is to develop varieties or strains with fruit of better color and plants with greater disease resistance than those now available. The interior of southern-grown tomatoes is often pale and unattractive, particularly when canned. The plants are subject not only to wilt but to certain leaf and other diseases difficult to control, and they do not grow, set fruit well, or ripen uniformly, in hot, dry weather. By hybridizing present varieties with certain wild and foreign forms, it is hoped that types can be bred which will have the desired characteristics.

There is no round-headed, early variety of cabbage which will endure southern winters without running quickly to seed as soon as the weather becomes warm in the spring. A variety with round heads which would go through the winter without injury and then produce marketable heads when growing weather arrived would fill a long-felt need. Charleston Wakefield possesses sufficient hardiness and resistance to premature seeding to yield satisfactory crops much of the time, but the trend of buying is away from pointed heads typical of this variety.

The chief limiting factor in the production of sweet corn is the corn earworm. This pest is largely responsible for southern people using field corn for roasting ears instead of sweet corn, which is usually damaged if not destroyed by it. Also some of the popular varieties of sweet corn grown in the North are weak-growing when planted in the South, due to lack of adaptation to the soil and climatic conditions of the region. The goal of the laboratory in this case is to develop varieties with both earworm and disease resistance, and which make vigorous growth and ears of a size to meet the wishes of growers and consumers.

Stations Work Individually

These are examples of the kind of improvements which are needed in practically all kinds of vegetables grown in the South. Crops other than those already under investigation which will be taken up as soon as circumstances permit are cantaloupes, cucumbers, lettuce, beets, carrots, peppers, and lima beans.

A number of the southern experiment stations have recently undertaken a considerable amount of vegetable breeding on their own account. For example, the South Carolina station and its branches are carrying on breeding work with asparagus, sweet potatoes, okra, lettuce, beans, and cabbage. The Georgia station has been working for a number of years to improve collards and peppers. At the Alabama station special attention has been given to the breeding of vegetables for home gardens, with special emphasis upon resistance to root knot. The Florida station has been noted for its work in developing disease-resistant watermelons but is also breeding better varieties of tomatoes, beans, celery, sweet corn, cantaloupes, and other

crops. The Louisiana station is doing breeding work with a number of vegetables, but its work with sweet potatoes, Irish potatoes, cabbage, onions, peppers, carrots, and tomatoes has been outstanding. The Virginia Truck Station was one of the first stations in the South to develop a notable vegetable variety when it introduced Virginia Savoy spinach. Other southern stations are carrying on breeding work of a character similar to that being done by the stations mentioned.

Laboratory Coordinates Work

Although there may be some duplication of effort with all this work being done, marked variations in conditions within the southern States make the problem a large one. With several workers interested in an individual crop, the chances are increased that worth while new varieties will result. The breeding laboratory with its larger resources and personnel is serving as a focal point in coordinating the vegetable breeding work of the region. Its staff is undertaking to combine disease resistance, hardiness, and other valuable characters of foreign types with the desirable characteristics of our present varieties.

The progeny resulting from these combinations will be tested at both the laboratory and the State stations. In such work thousands of individual plants must often be grown and observed in order to find one which closely approaches the type desired. When found, however, the one individual which conforms most closely to the ideal type may become the parent of a variety which will largely displace other varieties of that particular crop and may revolutionize its production. Varieties which in the past have fallen in this category are Stringless Greenpod bean, the old Rock Ford cantaloupe, Golden Bantam sweet corn, Marglobe tomato, and New York (Iceberg) lettuce. These were and are excellent varieties, but none of them meets the exacting standards which southern horticulturists have in mind for varieties they hope to obtain through this new breeding program.

In carrying out its program, the laboratory has made large collections of domestic and foreign varieties and species of beans, cabbage, tomatoes, watermelons, and sweet corn, which are grown in connection with the various phases of the work. One phase is a study of the method of inheritance of different characters including shape, color, and resistance to disease. Another phase is to produce epidemics of blights, mildews, and other diseases in order to test the resistance of the different stocks. Studies are also made to determine what characteristics may be associated with disease resistance. Then, through inbreeding followed by cross-breeding, efforts are made to combine the desirable characters to produce an improved variety. The final determination of the plant or plants combining the desired qualities can usually be accomplished only after large numbers of the offspring of the original crosses have been observed and compared. This, as may be imagined, requires much time and effort by skilled technicians.

Looking to the Future

The laboratory, however, is well prepared for this work, both as to equipment and personnel. The buildings, greenhouses, laboratory apparatus, and fields are adequate, and the staff is experienced in the technique of plant breeding and the related sciences. Dr. B. L. Wade, senior geneticist of the U. S. Department of Agriculture, with wide breeding experience in California and other parts of the West, is in charge of the work. He is assisted by Dr. C. F. Poole, cytologist, C. F. Andrus, associate pathologist, S. A. Morrell, associate biochemist, George Reynard, junior botanist, E. L. Blitch and P. C. Grimball, junior scientific aides, and Howard M. Thomas, junior clerk-stenographer.

The efforts of the staff have to date been devoted chiefly to observations of the large variety collections, studies of

the inheritance of various characters, inbreeding of a large number of types, and the hybridization of certain stocks. Considerable quantities of seed have been sent to the cooperating experiment stations for testing and observation during 1940.

A long-time view must of course be taken of a breeding program of this kind. Results cannot be expected in a year or two. However, the 3 years of actual work which the laboratory has been able to do has brought rapid progress, and with the various experiment stations helping, it will not be long before concrete evidence of the value of the undertaking becomes evident to southern vegetable growers. Sooner or later the South with high-yielding varieties of high quality vegetables may be able to develop a real canning and quick-freezing industry, limited so far because of low yields and the poor quality of the products. With heat, drought, and disease-resistant strains, home gardeners should be able to produce a supply of vegetables throughout the summer, and it will be possible for the commercial grower to increase his sales to northern markets by being able to ship products of better appearance and improved quality.

In addition, the production of vegetable seed, a line of work which cannot now be successfully followed in the South except with a very few crops, due to the prevalence of insect and disease attacks, may with varieties resistant to these pests become of considerable importance. Whether or not all this program is realized, it is certain that the vegetable-breeding laboratory will be able to make some very definite contributions to the vegetable-growing industry through its extensive investigations in this field.

Keeping Cool

(*From page* 5)

and pop, but ice cream was almost as scarce as it is in Europe today. Druggists sold remedies, not comforts, in those days. Most of the ice cream was made in hand freezers and served only at wedding parties or bazaars under oriental lanterns, and the cone was unknown.

Our gradual transformation from a sticky and rapidly spoilt food era into the present sanitary, temperature-controlled period of eatables has meant almost as much in creating employment as the motor vehicle itself. For one thing, it has allowed our complacent dairymen to build up the country's milk cow census to about one bovine for every five persons, and made our summers incomplete without ice cream vendors on every corner and milk shake mixers at every crossroads.

However difficult the cow may find it to keep herself cool in fly time, the modern four-teater of high test has done her part nobly in cooling off a continent. Then if you add to this the people employed in mechanical refrigeration, frozen food lines, and rapid transit delivery services, you will count up a sizable host catering to the art of keeping cool through a satisfied stomach.

It was my fate in boyhood to reside near a midwest summer resort consisting of gray rocks along a winding stream. During weekdays the place was a dull spot indeed, barkers in lazy indifference, steamboats tied to the wharf, soda-jerkers polishing glasses and hoping for feminine conquests galore when the next Sunday excursion train arrived. Captains waited all week for a boatload, and almost came to blows over possession of baggage and tickets.

Today that haven is a daily gold mine by comparison, and farms that once lay on the utmost outskirts of sylvan charm, now have established themselves in the glory of golf courses

and shuffleboard and red awnings. Gasoline launches ply the river bends hourly, and a stream of gawpers stares at the sandstone crags from daylight to darkness, while they have even talked of colored spotlight illumination for the "Injun" pow-wow. Rows of cabins that would scare pioneer Daniel Boones into further plunges westward have been erected at the side of noisy filling stations. Spiders, roaches, and mosquitoes vie with the guides in showing visitors primitive nature lore.

But in this particular season things are in a bad way for the professional keep-coolers, and the intervening reason for this slump is the collision of the planet Mars with the electoral college. Fellows in the cities with uncertain jobs and hysterical tendencies would not be able to abate their feverish worries trying to cool off at ten dollars per head per day on anybody's piazza. All of which shows again that outward physical coolness is not all there is to summer comfort.

During such seasons as we now experience, I am sure that the wise man will be the one who eschews all portable radio receivers and delves into the piney woods in search of solace that comes with silence. Thus I feel that he who prohibits himself and family from a vacation and a cooling-off spell just because there is ruction abroad and a rumpus at home is just a misanthrope.

You might pack yourself in dry ice, turn on a power fan, and try to read marrow-freezing murder yarns—yet if you persisted in taking a daily paper and continued to tune into the war zone broadcasts, any domestic scene would be hotter than a foundry. All the existing talent of news-casting and radio-blasting is intended to keep you full of consternation, commotion, and calamity. You are caught between ballots and bullets, between a shooting invasion and an economic revolution, between the dogs of war and the bow-wows of politics. How in thunder a normal man can avoid a rise in temperature is a problem for the stoics.

By this I invite no fifth column invaders either. For I think a fellow can go off by himself for a little fishing and be as thoughtfully patriotic and purposeful as he who stays home and gets gassed by hysteria. Paul Revere was mighty useful as a gallant arouser, but I presume the most shooting was done by colonial farmers who stuck to the plow handles until they had good reason to grab their muskets. Dry powder is no more essential than cool heads these days.

A cool head is not essentially a cold one. Nobody need waste much time worrying, however, about the cold-blooded American. Even though we live in the temperate zone, for the most part we are not prone to frigidity in our expressions and actions. Hence application of a dose or two of figurative ice water to hot heads is not going to leave us unmindful of obligations or put us into a stupor of indifference.

LET'S hope that neither the heat nor the hysteria will last much longer; and from our long familiarity with the goings and comings of both seasons and sentiments hereabouts, I am confident that by the time we meet again along in October the autumn chill and the realistic advent of winter will have operated to our satisfaction. Languor and inertia will give way to bracing action, and memories of the sweats and mental fevers encountered in the summer of 1940 will be gone from us.

Our last few weeks' fling at blistering sunshine reminds me of the feeling experienced going barefoot in the sand. Remember how rivulets of coolness ran up your freckled shins when you jumped into a plot of shady grass after walking behind the cultivator in the yellow sand drifts? Yes, it sometimes pays to warm up a trifle, just for the pleasure of cooling off again. And that's where I'm leaving you, right there in a cool spot, so you can better endure the political parade when it begins marching past.

"The girl next door ought to pull down her shades."

"Has she no shame?"

"Worse than that! She has no shape!"

At a party in Hollywood, one of the stunts was to ask each guest to write his or her own epitaph and, when called upon, to get up and read what they had written. A much-married movie actress sitting beside Will Rogers said she didn't know what to write. Will said, "If you will read it just as I write it, I will do it for you." This is what she read: "At last she sleeps alone."

Before marriage a man yearns for a woman. After marriage the "Y" is silent.

Harry—"Well, I'll have to go home now and explain to my wife."

Henry—"Explain about what?"

Harry—"How do I know?"

New Rates Effective

A lady was riding on the train with her son. The conductor came by and she said, "A fare for me and a half fare for the boy."

The conductor looked at the boy and said, "Lady, that boy's got long pants on."

"In that case," said the lady, "a full fare for the boy, and a half fare for me."

Son—"What is college bred?"

Pop—"My boy, they make college bred from the flour of youth and dough of old age!"

A Stern World

A man driving through the country noticed a farmer with a bull hitched to the plow. Stopping his car, he said to the farmer: "You have a beautiful farm here and everything looks prosperous and I am wondering why you don't have a tractor to do your farm work."

"We have two tractors in the barn," replied the farmer.

"Then why in the world have you got your cultivator hitched to a bull!" exclaimed the man.

"Well, friend, I'll tell you," explained the farmer. "I'm just trying to teach this bull there is something in life besides romance."

Costly Mistake

Sam: "Where you all get dat black eye?"

Rastus: "Dat widow we meet last week ain't no widow."

Doctor (examining throat): "Say a-a-ah."

Tony: "I no spicka da Ingleesh."

An old lady kept a parrot which was always swearing. She put up with this but on Sunday she kept a cover over the cage—removing it on Monday morning.

One Monday afternoon she saw her minister coming toward the house, so she again placed the cover over the cage. As the reverend gentleman was about to step into the parlor, the parrot remarked: "This has been a d——— short week."

FERTILIZER *Films* AVAILABLE

WE ARE NOW PREPARED TO LOAN without charge to agricultural colleges and experiment stations, county agricultural agents, vocational teachers, responsible farm organizations and members of the fertilizer trade, several films bearing on the proper use of fertilizers, particularly potash. *Distribution is being made from our respective branch offices as noted in the listing below, and anyone interested in showing these films should direct their requests to these offices.*

Potash in Southern Agriculture

Covers fertilization and potash deficiency symptoms of cotton, tobacco, and corn in the various States of the South. Depicts experimental work now in progress at several Experiment Stations, also crops in the field, fertilizer placement work, and scenes in a fertilizer factory.

16 mm.—sound, color—running time 20 min.

Projectors will be loaned where necessary.

Write to—American Potash Institute, Inc., Mortgage Guarantee Building, Atlanta, Georgia.

Potash From Soil to Plant

Covers testing soils to determine fertilizer needs, sampling of soils, potash deficiencies on prunes and grapes, also effects of fertilization on Ladino clover.

16 mm.—silent, color—running time 40 min. (on 1600 ft. reel).

Write to—American Potash Institute, Inc., Beans Building, San Jose, California.

Bringing Citrus Quality to Market

Shows influence of fertilizers, particularly potash, on yield and quality of citrus fruit. Quality factors include thickness of rind, volume of juice, weight and general appearance of fruit.

16 mm.—silent, color—running time 25 min. (on 800 ft. reel).

Write to—American Potash Institute, Inc., Beans Building, San Jose, California.

Machine Placement of Fertilizer

Covers methods of applying fertilizer to California orchards, lettuce, and sugar beets. Shows scenes of various types of apparatus devised by growers for applying fertilizer in orchards and on row crops.

16 mm.—silent, color—running time 15 min. (on 400 ft. reel).

Write to—American Potash Institute, Inc., Beans Building, San Jose, California.

New Soils From Old

This film was prepared for the Department of Agronomy, University of Illinois. Deals with the experimental work on Illinois Soil Experiment Fields and stresses the benefits from a balanced soil fertility program using limestone, phosphates, and potash in growing corn, wheat, clover, and other crops.

16 mm.—silent, color—running time 40 min. (on both 400 and 1600 ft. reels).

Write to—American Potash Institute, Inc., Life Building, Lafayette, Indiana. Please indicate size of reels desired.

Fertilizers Improve Midwest Crops

Shows effects of proper fertilization on the growth of corn, wheat, alfalfa, and other crops in Illinois, Indiana, and Iowa. Includes potash, phosphorus, and nitrogen starvation symptoms and their confirmation by chemical tissue tests.

16 mm.—silent, color—running time 40 min. (on both 400 and 1600 ft. reels).

Write to—American Potash Institute, Inc., Life Building, Lafayette, Indiana. Please indicate size of reels desired.

Requests for these films should include information as to group before which they are to be shown, date of exhibition, and period of time of loan.

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